







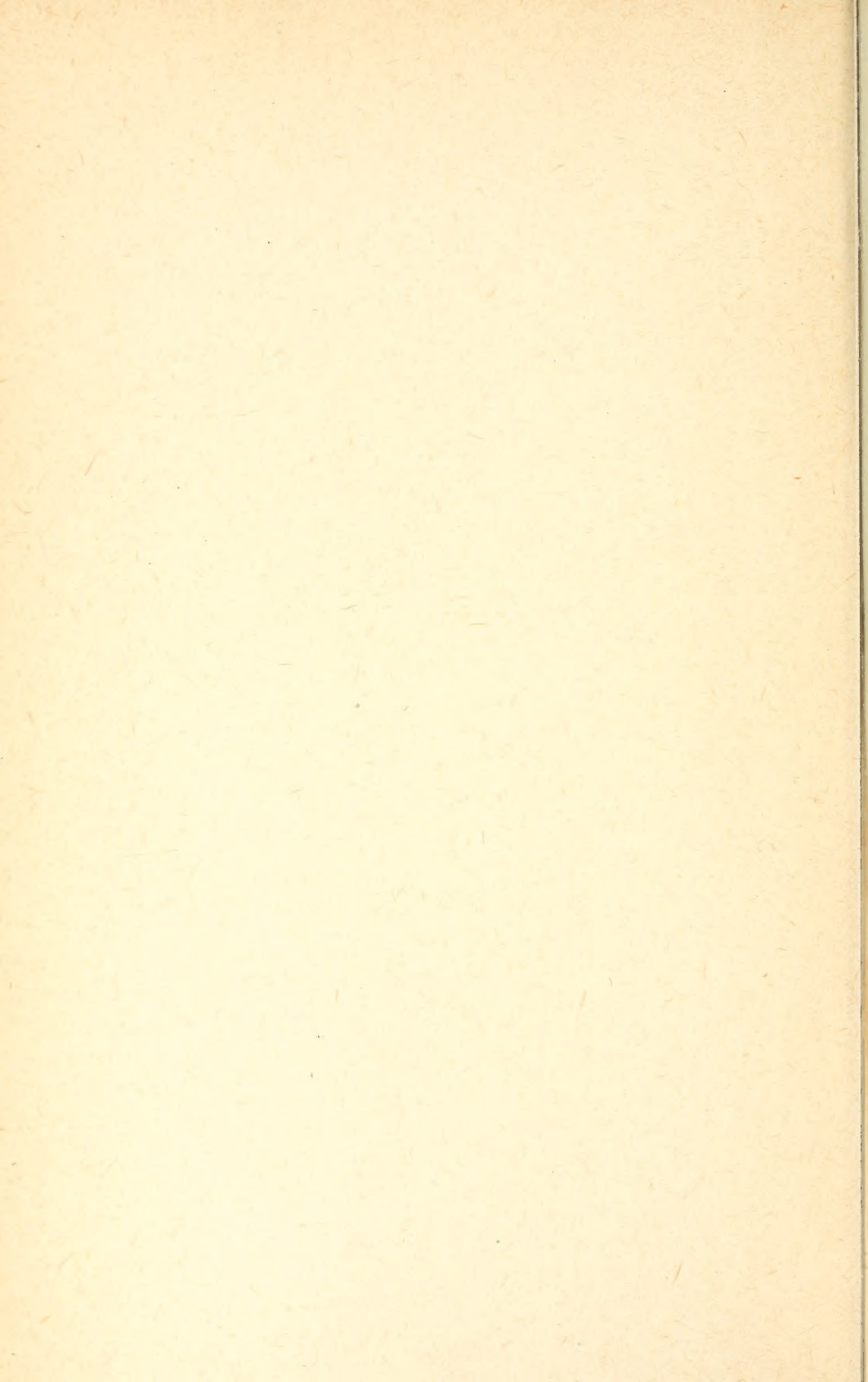
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1921

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# PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES  
AND IMPROVEMENTS

IN THE  
MEDICAL AND SURGICAL SCIENCES

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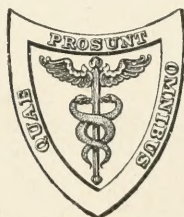
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VOLUME I. MARCH, 1921

SURGERY OF THE HEAD, NECK AND BREAST—SURGERY OF THE THORAX, EXCLUDING  
DISEASES OF THE BREAST—INFECTIOUS DISEASES, INCLUDING ACUTE  
RHEUMATISM, CROUPOUS PNEUMONIA AND INFLUENZA—  
DISEASES OF CHILDREN—RHINOLOGY,  
LARYNGOLOGY AND OTOTOLOGY




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1921

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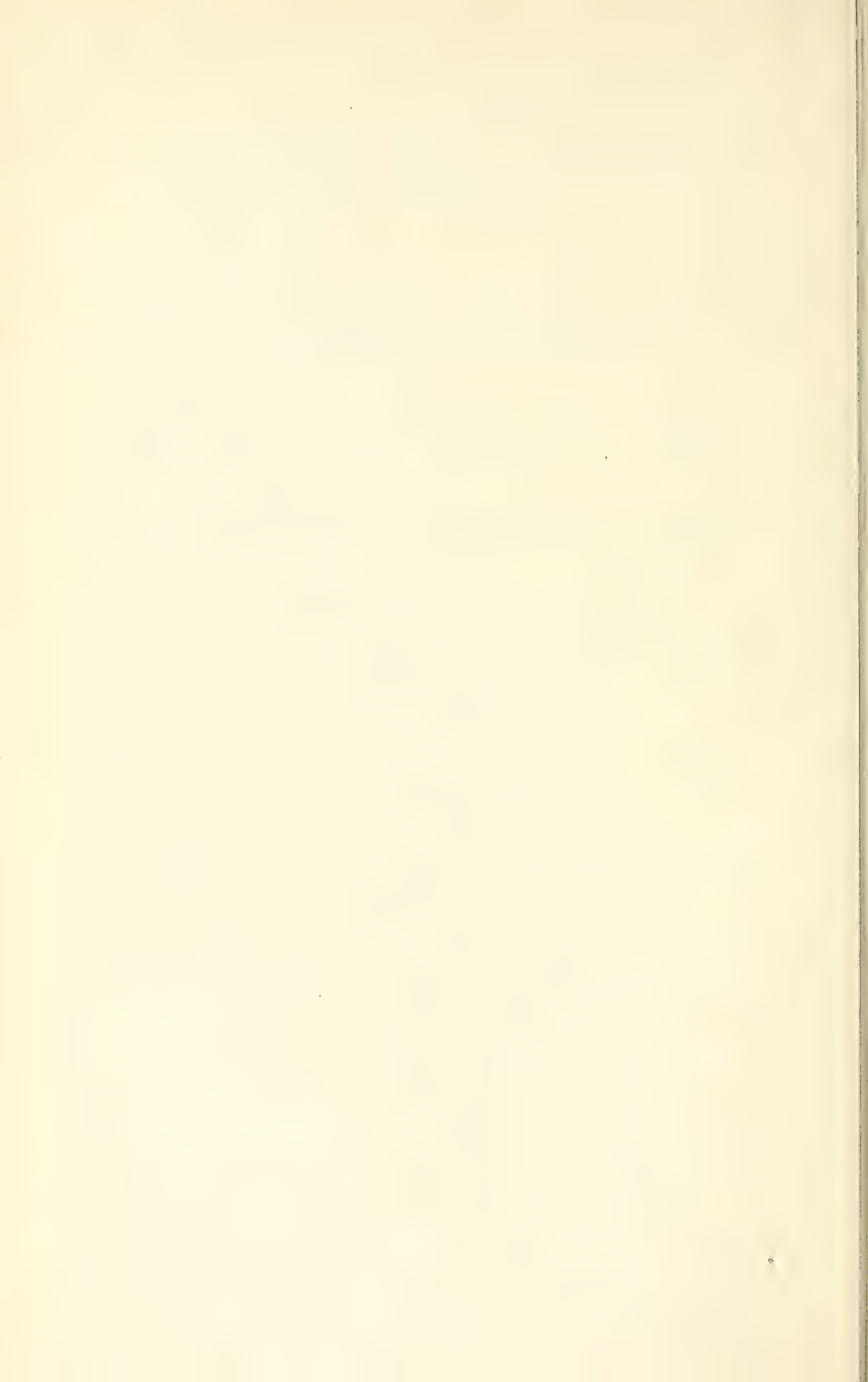
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# PROGRESSIVE MEDICINE.

MARCH, 1921.

## SURGERY OF THE HEAD, NECK AND BREAST.

By CHARLES H. FRAZIER, M.D.

**Trigeminal Neuralgia.** The apparent increase in the incidence of trigeminal neuralgia, while difficult to explain, is responsible, I take it, for a revival of interest in the method of treatment and control. My attention was drawn to an article by Wilfred Harris<sup>1</sup> by some observations he makes as to its etiology. The fact that efficient interruption of afferent impulse gives instant relief is sufficient proof, he thinks, that the neuralgia is caused by stimuli affecting the nerve endings at their periphery. In substantiation of this statement, he refers to the surprising number of cases in which the pain started immediately after dental operations or antral abscess; and although many years may elapse between the loss of teeth and the onset of the neuralgia, this does not exclude dental sepsis as the cause, since the infection has already spread into the filaments within the jaw. My experience does not support this view. There have been too many cases in my practice where there has been no evidence of dental sepsis, sinus disease or any other infective focus to warrant me in accepting this theory of peripheral irritation as an etiological factor.

As other predisposing causes, Harris mentions severe chill to the face (10), an intense emotion (5), a blow upon the jaw and heredity (5). He has had 11 cases under thirty, 2 in which the onset dated back to the seventeenth year. I have never seen a case under twenty years and but two or three under twenty-five. In fact, when a patient presents herself for treatment under thirty, I am always on my guard and question the accuracy of the diagnosis. What Harris says about the influence of the weather is in part true. It is a waste of time and money to send a patient to a hot climate, I admit, but it is also true that the majority of patients dread the approach of the winter months because of the increasing frequency and severity of the attacks.

Whatever may be said of the obscurity as to the etiology, there is entire agreement as to the treatment on the part of those who know the disease. There are but two accepted methods of controlling the pain,

<sup>1</sup> British Medical Journal, May 22, 1920.



the radical root operation and for temporary relief the alcoholic injections; the latter have entirely replaced the peripheral operation.

In Harris' opinion the radical operation should never be undertaken until the ALCOHOLIC INJECTIONS have been tried. This is a pretty sweeping statement and does not exactly express my views. These I have outlined in previous numbers of PROGRESSIVE MEDICINE. Suffice it to say here that, as a rule, unless the radical operation is distinctly contra-indicated, I leave the selection to the patient, after I have fully acquainted him with the essential facts. Usually, the patient will elect the injection treatment if he has been afflicted but a short time; he may prefer to have the injection repeated two or three times in as many years, but by that time he is discouraged and pleads for a radical operation.

My experience does not bear out the impression one gets from reading Cushing's<sup>2</sup> article on the Role of Deep Alcoholic Injections in the Treatment of Trigeminal Neuralgia. I quite agree with him that the injection should be given only by practiced hands and have observed in my own clinic numerous failures at the hands of those totally inexperienced. But I have not seen as many or as serious after-results as Cushing records, such as paralysis of the oculomotor nerves, sloughs of nasal bones, labyrinthine trouble; Cushing records 4 cases of complete facial paralysis, I have seen none that were complete. Stiffness of the jaw from infiltration of the pterygoids I admit is not uncommon.

Among the complications of injections of the ganglion Härtel includes involvement of the third, sixth and motor root of the fifth and keratitis. Injection of the Eustachian tube may be avoided; should the patient complain of pain, the needle should be inclined upward. Härtel never saw an injury of the internal carotid artery or the cavernous sinus, but heard of 2 cases in which the sight of the eye was lost, in 1 because of cavernous sinus thrombosis. He had 1 case of meningitis after injection of the ganglion with novocaine in an operation for carcinoma, but has seen none after alcohol injections.

Pilcher<sup>3</sup> says the Eustachian tube may be avoided by using a 5.5 cm. needle with an angle as recommended by Cieszynek. He heard of 1 case in which blindness followed an injury to the optic nerve and in 1 of his own cases a central scotoma formed, with contraction of the visual field. Keratitis, the most serious complication, never develops, he says, unless anesthesia is complete. One of his patients lost an eye. If the corneal reflex is completely abolished, he instructs his patients to wear automobile goggles.

After all, the recital of these unfortunate complications should not be interpreted as an argument against alcoholic injection, but rather against their employment by inexperienced hands. The body of Cushing's article gives one the impression that Cushing is trying to make out a strong case against alcoholic injections as a legitimate method of treating trigeminal neuralgia, but his conclusions give one a rather different impression. With these I think no one will take issue, save perhaps his unqualified disapproval of injections of the ganglion itself.

<sup>2</sup> Journal of the American Medical Association, August 14, 1920.

<sup>3</sup> Wiener klin. Wchnschr., May 20, 1920, No. 21.

"1. Deep extracranial injections of alcohol into the maxillary and mandibular nerve trunks near their foramina of exit from the skull have completely superseded peripheral neurectomies.

"2. In neuralgias limited to one of the two lower divisions, and which may possibly not extend into the other trigeminal areas, alcohol injections represent unquestionably the treatment of choice.

"3. When the neuralgia has spread beyond its original area and come to involve that supplied by the adjacent division, a trigeminal neurectomy must be contemplated; but if no preceding deep injection has been given, it may be useful not only in insuring the type of the neuralgia but in giving the patient some warning as to what the numbness resulting from the neurectomy may amount to.

"4. They are sometimes useful, furthermore, in determining in doubtful cases whether the syndrome is a true neuralgia of the *tic douloureux* type or one of the peculiar and rare pseudoneuralgias not amenable to relief either by injections or neurectomies.

"5. Even the extracranial injections are not entirely free from risk, and in no cases should they be purposefully pushed to the point of attempting an injection of the Gasserian sheath itself.

"6. With such perfect and permanent results as may be secured today by a trigeminal sensory root avulsion, the prolonged and repeated use of injections in refractory cases which involve more than one division should be deplored."

With regard to the technic of injection the directions, as given by Patrick many years ago, today require no revision. But it requires more than a familiarity with this to be successful. Experience and visualization of the anatomy of the region traversed by the needle are two of the three essentials. I think my position is unique with regard to a general anesthetic. As my experience grew, I found I was able to reach the nerve just as accurately with the patient under an anesthetic (nitrous oxide) and no one will question the advantages to the patient. The alcohol injection is dreaded by the patient; he dreads the thought of a repetition should he have a recurrence. If performed in the dreamy state of a nitrous oxide anesthesia, the injection is robbed of its terrors.

It is rather interesting to review Härtel's last contribution to the treatment of trigeminal neuralgia by *alcoholic injection of the Gasserian ganglion*, as he was one of the first, if not the first, to introduce this treatment. In his last communication,<sup>4</sup> he gives us the permanent results of some 50 cases, of which 41 were under observation over six months. In recording the results, he divides the cases into two groups, those with "total permanent anesthesia" and those with "partial permanent anesthesia." Of the first group, in 37 cases which were included in observations made between January, 1912, and July, 1914, and after the war between December, 1918, and August, 1919, there were 21 of those with total permanent anesthesia and 16 with partial permanent anesthesia. Of these 37 cases, 25 had been made free from recurrences for periods of one-half to seven and one-half years and in 5 cases in

<sup>4</sup> Deutsche med. Wehnschr., May 6, 1920, No. 19, 46.

which there was recurrence, 4 were cured by a second injection, 2 were only improved and 2 were unimproved. Four cases were listed as hysterical.

In Härtel's opinion, one can usually give a pretty definite prognosis as to the permanency of anesthesia and therefore the permanency of cure by the tenth day and at the end of the third month, if the anesthesia persists, the likelihood of recurrence is very trivial. In other words, permanent anesthesia usually implies permanent relief, that is providing the anesthesia is distributed to all three branches. Practically all cases with partial anesthesia recur, although the periods of relief in some cases may be very long. When recurrences take place, they usually are observed in from six months to two years. If the patient is free from recurrence for a period of five years, the case is regarded as a cure. I was much interested in Härtel's reference to the hysterical group. I have always been on the lookout for the hysterical cases, because neither the alcoholic injections nor the operation will benefit the patient. In fact, in some cases it seems to make them worse. Härtel has observed this too in his alcoholic injections and notes that his patients complain of pain even when the anesthesia is complete. They always complain, too, more of the loss of sensation than does the case with the genuine form of the disease. He urges, and I heartily endorse this recommendation, that in all doubtful cases the patient should be left alone. I think perhaps that this might be modified to the extent that an attempt may be made to differentiate the hysterical from the normal by an alcoholic injection of a single division.

Pilcher<sup>5</sup> recognizes the difficulties and dangers of ganglionic injections and reserves them for cases in which all other methods have failed. He believes they take the place of the radical operation, although he acknowledges corneal ulcer to be a common complication.

With regard to the technic, he uses the technic of Härtel, of Tapas of Constantinople, and of Harris, with preference for the latter. If the first division is not involved, he does not inject the ganglion. If it is, he injects the alcohol very slowly in the following way: (1) The injection begins before the needle enters the foramen ovale. This should be followed by complete anesthesia in the third division. (2) He advances the needle and continues the injection drop by drop; he looks for slight diminution of sensation in the ophthalmic division, but pain may continue in the upper teeth. (3) He continues the injection and notes slight diminution in the second division still with hypesthesia in the ophthalmic division. (4) The injection is continued and sensation is lost in the ophthalmic division, but the corneal reflex is only partially abolished. (5) If two more drops be injected, the corneal reflex will be entirely abolished, and this he tries to avoid. (6) The needle is rotated 180 degrees and a few drops more injected. The corneal reflex will remain unchanged and the patients complain of pain in the ala of the nose. (7) A few more drops and the anesthesia in the second division will be complete. More important than the amount used, he averages

<sup>5</sup> Wiener klin. Wchnschr., February 12, 1920, No. 7.



4.68 cm. (maximum 15 c.c.), is the close observation of the effects. As additional amounts are injected, the effect on the adjacent nerves should be watched, especially the effect upon the external rectus, upon hearing and vertigo. If the opposite eye is not sound, the ganglion should not be injected. Because of the proximity of other cranial nerves, Pilcher is afraid to inject the second division.

I am astonished at the amount of alcohol he uses, 10 to 15 c.c. This amount obviously could not be contained within the sheath of the ganglion and some must escape into the subarachnoid space.

Harris,<sup>6</sup> within the last ten years, has injected the ganglion in 63 cases; in 31 of these the anesthesia was total and no recurrence has taken place. (The writer does not say how many years this statement covers in individual cases.) If the anesthesia is only partial, recurrence is the rule.

The serious aspect of ganglionic injections lies in the frequency of corneal complications. Härtel acknowledged one in four. Flesch believes at least 50 per cent. will have eye troubles. Cushing compares these figures with his sensory root operation after which, he says, not one in ten should have any subsequent trouble with the eye. The incidence of corneal complications after alcoholic injection is a serious indictment and should prohibit injection of the ganglion save in exceptional instances; the occasional case of trigeminal neuralgia when the condition of the patient permits of no operation as in inoperable carcinoma of the face. In the latter, I find I can give a great deal of relief by deep injections of one or the other divisions or the ganglion itself.

Harris' experience with corneal complications after injection of the ganglion puts him in a class by himself. He says, "Keratitis is a risk if the cornea is anesthetic after injection of the ganglion, but this may *always* (italics mine) be avoided by proper precaution." What are the precautions? Strapping of the lids for the first week and boracic acid injections. If Harris can prevent keratitis by so simple a remedy, others should attain equally good results, and, if this be true of keratitis after alcoholic injections, it should be equally true of keratitis after section of the sensory root. But, as a matter of fact, we know that it is not. Keratitis will develop occasionally after the radical operation despite the closure of the lids.

The radical operation, section of the sensory root, as proposed by Spiller in 1901, continues the accepted method of the day both here and abroad. It is so eminently satisfactory that there is no need of revision. Since Spiller has long been credited as having proposed section of the sensory root as a substitute for gasserectomy, I was much entertained by the following which appeared in the abstract columns of one of our leading American journals.

"Dr. De Beule, who originated the surgical treatment of facial neuralgia by section of the posterior root of the Gasserian ganglion, has lately reported his personal experiences to the Académie de Médecine. He claims that the method has two advantages: The results are more permanent and more constant than those obtained by injections of

<sup>6</sup> Loc. cit.

alcohol and there is far less danger than with gasserectomy. In 15 patients on whom the operation was performed, no recurrence of the affliction was observed. He has, however, seen some trophic disorders of the side of the eye, and facial and oculomotor paralysis, but these sequelæ proved very transitory. It seems at present that De Beule's operation is coming more and more into use."

In recording his experience with this operation, Perret<sup>7</sup> states that section of the sensory root, after the recommendation of Spiller in 1901, has become the classical operation.

Hutchinson is the only surgeon with a large experience with trigeminal neuralgia who does not practice the root operation. He still practises the operation known by his name (resection of two-thirds of the ganglion) an operation which, by the way, Harris says is not a "certain permanent cure," as he has seen 3 cases of relapse.

In the recent edition of his monograph "*Facial Neuralgia and its Treatment*," he describes the Spiller operation as more difficult, dangerous and uncertain than his own, and then quotes the statistics from his own and Horsley's clinic in 200 cases, with a mortality of 4 per cent., and characterizes these results as "surely satisfactory enough." In my clinic at the University Hospital where the root operation is practised exclusively, the mortality is well below 1 per cent., almost a negligible factor. Hutchinson credits the sensory root operation to Horsley, who, in 1891, cut the root back of the ganglion and his patient died of shock seven hours later. In 1901 and 1902, however, Spiller, he says, again brought it forward. The dates are correct, but it would have been more nearly the truth had he amplified his statement to include the following: (a) that Horsley, so far as one can ascertain from his publications, never repeated the operation and presumably abandoned it; (b) that the method of approach in Horsley's case was radically different and more difficult than that proposed by Spiller and Frazier (Horsley approached the sensory root by elevating the temporosphenoidal lobe after reflecting a dural flap); (c) that Spiller's recommendation was supported by a series of animal experiments which proved convincingly that the results would be permanent, as the root could not regenerate itself; (d) that the claims of superiority of this operation, as safer than gasserectomy, were not made until proved by actual experience on the operating table, and (e) that, as a result of the combined experimental and clinical evidence, this operation (properly designated as the "Spiller" and not as Hutchinson styles it, the Spiller-Frazier method) has been recognized in all civilized countries as the appropriate radical procedure in the treatment of trigeminal neuralgia.

Bilateral trigeminal neuralgia is exceedingly rare. I have seen only 3 cases in our 400 cases. Harris has seen 25 bilateral cases in a total experience with 312, or about 8 per cent. He goes on to say that bilateral gasserectomy is an impossible operation for bilateral cases, owing to the destruction of the motor branch of the fifth nerve on each side and the consequent jaw drop. This brings to mind a recent innovation in my

<sup>7</sup> Schweizerische med. Wehnschr., 1920, No. 25.

technic for root resection whereby I have been able to conserve the motor root. This is a matter of considerable importance both from the cosmetic and functional point of view and at the same time removes the objection to the operation in bilateral cases.

In a well-written paper, Landon<sup>8</sup> gives us a very concise but comprehensive picture of trigeminal neuralgia and a very clear description of the radical operation. His results have been excellent, no deaths in 24 operations, and but 1 case of trophic keratitis which rapidly cleared up.

Ranzi,<sup>9</sup> writing from v. Eiselberg's Clinic, says they have had no experience with the Spiller operation. Since 1901, they have had only 16 operations, with 3 deaths (mortality 18 per cent.). They first used the Krause technic, then the sphenotemporal route, and, finally, the Lexer method. They do not resort to temporary closure of the external carotid; they do think it necessary always to ligate the middle meningeal artery, and they find the operation more difficult if alcoholic injections previously have been given. And now we are asked to place the *x*-rays in the category of accepted methods of treatment. Lenk tells us that they are being used more and more frequently, but that they are effective only when the nerves have not been tampered with by the surgeon. Of 11 cases, there was no improvement in the 6 which had an injection or operation; of the remaining 5, not previously treated, there was striking improvement following *x*-ray therapy. Dr. Martel<sup>10</sup> always begins the treatment of trigeminal neuralgia with alcoholic injections. If these relieve and the pain recurs, he performs the sensory root operation. All told, he has done 14 operations, with complete success in 13.

One hears a good deal lately about NEURALGIA OF THE SPHENOPALATINE GANGLION. It is a rather complex picture and the symptoms are widely distributed, through sympathetic connections to points far distant from the trigeminal zone. This so-called Sluder Syndrome has been described thus by Pollock:<sup>11</sup>

"The neuralgic syndrome consists of pain, intense and excruciating in character (in some cases, of milder variety), radiating to any and all points supplied by the branches of the ganglion. The typical location of the pain is over the root of the nose, in and about the eyes, over the frontal region, into the pharynx and tonsil region, in and around the ear, posterior to the mastoid, into the occiput, to the neck, the shoulder, the arm and, at times, even to the fingers. The most severe and constant pain seems to concentrate at a point about 6 mm. back of the mastoid. Not all patients present this typical picture.

The sympathetic syndrome comes on at any time of the year, is irregular in its time of appearance, duration and severity, and is in no way associated with the ripening of the various pollens, to the inhalation of which hay-fever has been ascribed. On the contrary, those of my patients who have had these symptoms for a number of years inform me that the attacks scarcely ever occur during August or September, and that if they do, the severity of the attack is lessened.

<sup>8</sup> Cincinnati Journal of Medicine, July, 1920.

<sup>9</sup> Wiener klin. Wchnschr., 1920, No. 21, p. 445.

<sup>10</sup> Paris Médicale, No. 40, vol. x.

<sup>11</sup> Journal of the American Medical Association, vol. lxxiii, pp. 591-593.



The paroxysms are often brought about by contact with or inhalation of a specific kind of perfume, a particular flower, the odor of various animals, a slight draft of air, or the inhalation of ordinary dust; or they may come on apparently spontaneously. These paroxysms usually begin just on arising, with attacks of sneezing. The patient sneezes from five to fifty times, and the attack is followed immediately by a profuse watery discharge from the nose. At the same time there is a reddening of the mucous membrane of the eyes, accompanied by profuse lacrimation. The nose becomes blocked, and breathing is naturally difficult. These symptoms may be of short duration, lasting only an hour or so, or they may continue for six or eight hours, and then suddenly abate, only to reappear on succeeding days, or when the patient is again brought into contact with specific irritant. Some of these acute attacks may continue for a week or ten days, and some, only a day. The appearance of the nose between attacks, is usually normal except, possibly, for a slight paleness of the mucous membrane. During the attacks, however, the turbinates are swollen, soft, pale and edematous, and have a boggy appearance. This is especially true of the inferior and, to a lesser degree of the middle turbinate. The mucous membrane of the septum is also pale. The eyes are red, the conjunctiva is injected, and at times there is an accompanying itching.

The secretion is thin, watery and acrid. After a few days of the attack, the upper lip becomes irritated and excoriated from the constant clearing and blowing of the nose, and from the acrid reaction of the secretions. Even the entire tip of the nose may become red and swollen from the same cause.

This neuralgic syndrome, as contrasted with the sympathetic syndrome, is not altogether germane to the discussion of neuralgia. Because of the close proximity of the sphenopalatine ganglion to the sphenoid sinus the posterior ethmoidal cells and the nares, infections of these cavities is in many cases the underlying pathology and yet there are cases without any demonstrable lesion."

Although properly belonging to the field of rhinology, I have included this so-called NASAL GANGLION NEUROSIS in our discussion of trigeminal neuralgia, because the question of differential diagnosis might often come up and the treatment applicable for one is not applicable for the other. Apparently, the most reliable aid to diagnosis is the application of a strong cocaine solution, 20 to 90 per cent. to the region of the sphenopalatine foramen. If it is a case of nasal ganglion neurosis, the pain will stop instantly, and it may then be assumed that the proper treatment is by alcoholic injections of Meckel's ganglion. The method of injection was first worked out by Sluder, but I shall describe it in Pollock's words:

"I first cocaineize the posterior end of the middle turbinate and the wall just behind it, with a 20 per cent. solution of cocaine. Then a sword needle of Sluder is employed, a straight needle  $5\frac{1}{4}$  inches long with a cross bar near the end. The needle is introduced from the septal side of the nose. I transfix the posterior end of the middle turbinate and press the needle gently through the turbinate until the posterior wall is felt. The needle is then pushed upward, outward and backward through

the bony wall which is the anterior boundary of the sphenomaxillary fossa, in which the ganglion lies surrounded by connective tissue. Usually, by tactile sense, one feels the needle slip into the cavity. The ganglion is about 0.66 cm. back of the wall. A 5 c.c. Luer springle, filled with a 2 per cent. solution of phenol (carbolic acid) in alcohol is then attached to the needle, and from 5 to 15 minims are injected. If the needle succeeds in penetrating the ganglion, the patient complains of excruciating pain in the eye, ear, top and back of the head and in the shoulder, but should the phenol alcohol solution merely surround the ganglion, the pain will be less severe.

"The pain usually lasts anywhere from a few minutes to twenty-four or forty-eight hours, and it is in cases in which the pain is prolonged after injection that the end-results to the patient are most gratifying. The number of injections necessary is variable. If the ganglion is penetrated the first time, as indicated by the severe pain, only one injection is required. If not, two, three or four attempts may be made at intervals varying from a few days to several weeks. If no relief is obtained after four such injections, I feel that further attempts would be useless. Often we find the posterior wall so thick that it is impossible to push the needle through, and in these cases I have resorted to the use of a mallet to drive it into the cavity. In using the mallet one is not so sure of being in the proper place, so I usually withdraw the needle and then reintroduce it by tactile sense, as I then have a far better knowledge of where the end of my needle is.

"I have not said anything concerning the medical treatment of or rather topical applications to, the region of the sphenopalatine foramen, for the reason that in my experience I have seen nothing but the most transitory results occur from these applications, and do not believe the method worth trying."

Barlow<sup>12</sup> writing on this subject, says the clinical picture might well be confused with migraine, but the distinguishing feature is the absolute relief in the nasal neuralgia which follows the application of cocain. He uses the term ganglion "headache" whereas it is more often referred to as a ganglion neuralgia, but he says there is ample evidence to demonstrate the existence of this syndrome and the treatment is sufficiently encouraging to warrant its study and investigation, eventually perhaps "to develop a form of operative treatment, such as is now used in the Gasserian ganglion cases."

In addition to the papers of Pollock and Barlow, I have read Sluder's monograph, "Headaches and Eye Disorders of Nasal Origin," and from all these one rather gets the impression that this nasal neuralgia is rather prevalent, but I must confess that I can recall but two cases among the several hundred cases of neuralgia that were referred for diagnosis and treatment.

In looking over Sluder's case histories, I noted that in some instances this nasal ganglion neurosis, as he calls it, was said to be a forerunner of "tic douloureux." Inasmuch as the fundamental pathology in this nasal

<sup>12</sup> Journal of the Michigan State Medical Society, August, 1920.

ganglion neurosis is an infection, usually of the sphenoid or ethmoid sinus, the inference might be drawn that these infections were also responsible for the tic douloureux which developed later. This is entirely contrary to the views I hold as to the etiology of tic douloureux. Sluder, however, evidently thinks otherwise, for in his case histories I read that one of his patients with pain in the mandibular division "discovered a tooth was responsible for the tic;" and again Sluder says, "apparently different lesions of the peripheral distribution of the trigeminus produced the tic." If this be the case with Sluder's patients, he and I hold different conceptions of the "tic" in question. The tic douloureux, as I see it, is not of peripheral origin, has no etiologic relationship to peripheral foci of infection and is relieved only by alcoholic injections into one or the other branches of the ganglion or by resection of the sensory root. In another case he writes that a "tic" of the second and third divisions had lasted several years and had had peripheral injections *with no result*. I regard the effect of genuine alcoholic injections as an invariable and unfailing differential sign in the diagnosis between what I call the major neuralgias, or tic douloureux, and the minor forms of neuralgia. If, as in this case, the injection failed to relieve even temporarily, it may be assumed without question or doubt that the case was not one of major tic. For a long while I have been under the impression that the terms "tic," "tic douloureux," "trigeminal neuralgia of the major or epileptiform type" have been loosely employed as a comprehensive term to include all pains in the trigeminal territory. This is probably the explanation, in the reports from nose and throat clinics, of the reported cures of trigeminal neuralgia following the treatment of sinus infections.

As to whether the syndrome of Sluder can be accepted as a distinct clinical entity, I am really not competent to judge. I do not believe that nasal neuralgia blends into a true trigeminal neuralgia. At least I have never seen a case, and the etiology of the two forms is quite separate and distinct. Credit must be given Sluder for his painstaking study of the ramifications of the sphenopalatine ganglion and for his many interesting hypotheses around which he constructs his theories as to the origin and distribution of pain. In a personal communication, he writes me that the longer he works with this issue, the more convinced he feels that he is right on all the ideas he has previously entertained.

There is just one point about the effect of the alcoholic injection that I cannot understand. Why is the relief from pain not immediate after the injection? It is so after injection of the division of the Gasserian ganglion. Pollock says the pain after injections usually lasts from a few minutes to forty-eight hours, and it is in cases in which *the pain is prolonged after injection that the end-results are most gratifying!* How could that be true?

**Cerebral Tumors.** The most favorable of the malignant growths for surgical intervention are the endotheliomata and the most favorable location the motor area, because in this locality they give rise to significant symptoms early in the history of the growth. Jacksonian convulsions should always be looked upon with suspicion, with brain tumor in mind. Many a brain tumor has been detected alone by these Jacksonian



seizures, even though sometimes the tumor be of considerable dimensions. In many instances the differentiation between convulsions of tumor origin and those not of tumor origin is impossible. A few weeks ago I operated on successive days upon two patients with Jacksonian seizures. In one I found and removed a large endothelioma, in the other I found a cortical edema. In the *Annals of Surgery*, September, 1920, Ashhurst recites his experience with a case in point: The patient had had convulsions for a year, although lately there had been signs of pressure. The physical examination was practically negative, except for an extosis in the right parietal region of five years' duration. At the operation the bone flap was found eroded and was removed; the tumor, an endothelioma, 5.5 x 5 cm., was adherent to the overlying dura, which was removed and the defect repaired with fascia lata. The patient made a splendid recovery, but died suddenly five months later, cause unknown, during an operation for repair of the cranial defect.

Gliomata grow from the substance of the brain, endotheliomata from the dura, often from the falx, hence are usually readily accessible. The size of the tumor is of little moment. Before the Academy of Surgery, I<sup>13</sup> presented the specimen of an endothelioma of huge dimensions (Fig. 1). removed from a child six years old. The specimen was of interest because of its unusual size, because of its peculiar surface markings, and because of the comparatively short duration of any symptomatic evidence of an intracranial growth. The patient was perfectly well until within five months of the operation. At that time the following symptoms were observed in the order mentioned: vomiting, dulness, apathy, hemiplegia, and imperfect vision. Upon examination, the following clinical features were observed: (1) Head enlarged, suggesting hydrocephalus with distended superficial veins of scalp; (2) papilledema of 4 D. in each eye; (3) spastic hemiplegia, left; (4) convolitional markings of frontal bone. The operation was performed at three sittings. At the first the tumor was uncovered, but the enfeebled condition of the child did not seem to warrant further intervention at that time. One week later the flap was reflected and the tumor removed. It was easily differentiated from the surrounding brain tissue and seemed in size to occupy a space at least half as large as one hemisphere. The surface markings were not unlike that of the brain cortex, and those witnessing the operation thought a portion of the hemisphere was being removed. There was comparatively little bleeding until the tumor was finally separated from the falx. Hemorrhage was then profuse and could not be controlled except by pressure with a large cotton tampon. Any attempt to remove this tampon was always attended with recurrent bleeding. Accordingly, the cotton tampon was allowed to remain *in situ* and the wound closed without drainage.

The presence of the large tampon gave rise to no disturbing symptoms until the fourth day when there was a slight rise in temperature and a convulsive movement of the arm. The patient was taken to the operating room, where, under a very light ether anesthesia, the flap was again

<sup>13</sup> *Annals of Surgery*, September, 1920.

reflected, the dura opened, and the cotton tampon removed. Fortunately, there was no recurrence of hemorrhage. The cavity was filled with salt solution and the wound closed for the third time.

Sachs<sup>14</sup> review of eight years' experience with brain tumors includes a survey of 85 cases. Of this number, there were 21 gliomata (mortality 85 per cent.), 5 of which were classified as readily removed and 3 of which were successfully extirpated. In the second group there were 64 cases, including twelve cysts, thirty "undetermined" tumors, for which a decompression was done, and the nature of the remaining 22



FIG. 1.—An endothelioma of the brain, composed of two sections apparently distinct, the one to the left measuring 7.5 x 4 x 3 cm. and that to the right 10 x 10.5 x 4.5 cm. The surface markings resembled somewhat the cortical convolutions and its capsule a pial membrane.

cases is not indicated. In this second group the mortality was 17 per cent. The mortality for the entire series was 35.5 per cent. One of the reasons why gliomata are not seen until very late in the history of the growth is because there are often no signs of increased intracranial pressure. Sachs does not classify gliomata as malignant tumors because they do not metastasize. Could not the same be said of all other primarily malignant brain lesions? Speaking of the question of radical

<sup>14</sup> Archives of Surgery, July, 1920, i, 77.

removal, he says, "if we go beyond the limits of a glioma, we can remove it radically." No one would question this statement, but it of course implies a tumor of small dimensions. Personally, I regard the gliomata, as one sees them on the operating table, as inoperable growths except when they are encapsulated. (I have recently removed two distinctly encapsulated gliomata). The only successful extirpations in Sachs's clinic were in patients with symptoms of not more than four months' duration. "Every tumor should be treated on the theory that it may be a glioma." Why, if an equal number are endotheliomata?

A practical problem for discussion is brought up with the query whether, in gliomata, the type of operation is responsible for the mortality. Sachs says the latter plays no role, and on this point I agree with him. As many die after simple decompressions as after explorations. And why is this? In answer to this question Sachs says: In studying the specimens of fatal cases, I have been impressed with the fact that the brains in cases of gliomas are much more deformed than in other types of tumors.

Gliomas differ from other tumors in three respects: (1) they are faster growing; (2) they are very soft in consistency, and (3) they are not encapsulated. Are all or any of these factors responsible for these deformities? A rapidly growing tumor may produce more deformity of a brain than a slowly growing one, because the brain is not able to accommodate itself, and instead of becoming compressed locally, thus making room for the tumor, it is pushed away *en masse*. Slowly-growing, encapsulated tumors make room for themselves by causing a local atrophy. That rapidly increasing pressure may produce such deformity is well illustrated in a traumatic case. A tumor of soft consistency might also bring this about. Other possible explanations that have been suggested are that the tumor, since it is soft, would far more easily take up fluid from the adjacent brain substance by osmotic action, dehydrate it, and make the normal brain smaller in volume. Then, too, in rapidly growing tumors the bloodvessels do not have the well developed elastic layer that normal vessels have and consequently can be more easily compressed, and secondary edema would occur much more readily. Neither of these, however, seems an adequate explanation. The latter fact explains, I believe, why gliomas readily become edematous and take up more room after pressure has been released by a decompression operation; but it does not account for the cerebral deformity. I have thought that possibly gliomas not being encapsulated, may create different pressure conditions in the cranium than processes that are well encapsulated. Physicists I have consulted have been unable to give me any explanation that would support such an idea. I am, therefore, inclined to explain the deformity that we know occurs by the first of these three factors—the rapid growth.

A very important part of the treatment of gliomas consists in dealing with these deformities. If a tumor is removed in a case in which such a deformity exists, the sudden release of pressure results in the compressed and deformed brain trying to fill up the space, and the great edema that results may throw out of function centers at some distance from the



tumor and thus cause the patient's death. Therefore, before removing a tumor, we must try to reduce this deformity, which can best be done by a decompression operation on the side of the tumor; for if the decompression should be performed on the side opposite the tumor, the deformity would be increased. This is one of the principal reasons for performing operations in tumor cases in several stages. Thus, in these 85 cases we have performed 106 operations. To work in the intracranial cavity while the pressure is markedly increased is an unwise and well-nigh impossible procedure. A preliminary decompression helps to reduce the pressure; but, in addition to this, the dura, if possible, should never be opened until the intracranial pressure has been reduced to normal or slightly below normal. This is done most safely by withdrawing the fluid from the ventricle, not by lumbar puncture. Even after a bone flap has been turned down, lumbar puncture may result in a dropping down of the cerebellum on the medulla, resulting in the inevitable medullary collapse. Not infrequently the ventricle on the side of the tumor is collapsed, so that I make it a rule to take the fluid from the opposite ventricle. I have no other rule as to the amount of fluid I remove than to reduce the pressure, as evidenced by the tenseness of the dura to normal or slightly below normal. I realize that this method is crude; but until some one makes a tonometer similar to the one used by ophthalmologists to test intra-ocular tension, we must be content with this method. I have performed about 100 ventricular punctures, and have never yet observed any harm resulting from the procedure.

In the removal of a tumor, the surrounding brain tissue should be handled very gently, and the finger should, if possible, never be used for this purpose. Blunt dissection, I think, is preferable to a knife."

**SATURATED NORMAL SALINE SOLUTION.** In discussing methods for relieving pressure on the operating table during cranial explorations, I want to refer to the effects of the intravenous injection of saturated saline solution. In one of the neurological laboratories under the auspices of the Surgeon-General's Office during the war, Weede and McKibbin carried on some very interesting experiments upon the effect of the intravenous injection of a saturated salt solution. Among other things it was observed that as a result of tissue dehydration the brain shrank in volume. Already this principle has been applied to the relief of intracranial pressure with startling effect. The method is, however, not unattended with risks, so that it must not as yet be regarded as a recognized and approved procedure. Further observation must be made in the laboratory to determine how its use may be safeguarded before it can be resorted to with impunity. I have used it in 3 cases thus far but without any untoward effects. The first recorded clinical experience is from the clinic of Sachs<sup>15</sup> and the results were so striking that they should be described as he saw them:

In a recent tumor case (I.N., Surgical No. 8704) presenting marked pressure symptoms, a right-sided, subtemporal decompression was undertaken. The patient was in no condition to stand an attack on the tumor

<sup>15</sup> Journal of the American Medical Association, September 4, 1920.

itself. The dura, on being exposed, was found enormously tense. Puncture into the inferior cornu of the right ventricle resulted in a dry tap. Ventricle puncture into the left ventricle yielded a few drops of fluid, but not enough to affect the pressure. The dura was opened rapidly, but in spite of an immediate closure of the muscles, the cortex ruptured at several places. The patient did not clear up and was stuporous, as was to be expected. He was therefore given 100 c.c. of saturated salt solution intravenously, about 1 c.c. per minute. The result was startling. Before 15 c.c. had been run in, the patient brightened up, answered questions and showed marked signs of improvement. This improvement lasted about twelve hours, when the patient again relapsed into a semicomatose condition. On three successive occasions, administrations of the saturated salt solution improved the patient. After the third injection, the patient improved steadily. Daily examinations of the blood to determine whether or not the red corpuscles had become more fragile were carried out at the suggestion of Dr. Marshall, but no change was noted. The fragility never varied beyond normal limits, being always between 0.35 and 0.4 per cent. The blood-pressure during the first injection rose rather alarmingly from 150 to 185. The patient within a few minutes expressed a desire to void, and the diuretic effect of the salt was quite striking.

The subtemporal decompression wound sank in, so that what had been a tight, bulging hernia became a marked concavity. Dr. Belcher urged me to make use of this method during an operation. It seemed justifiable to try the method in a case in which the intracranial pressure could not be reduced by ventricle puncture. The case of I. N. seemed an ideal one. During the course of the operation the salt solution was injected and reduced the intracranial pressure so that a tumor of considerable size in the temporo-occipital region could be removed. The patient made an uneventful operative recovery.

Recognizing the possibilities of extraordinary service in its effect upon the excessive intracranial pressure of brain tumors, I have been turning over in my mind the question as to whether the process of dehydration by a saturated salt solution might not be almost a "specific" in the treatment of grave forms of cerebral contusion. It is well known that edema is one of the inevitable consequences of brain trauma and the determining factor in many of the fatal cases. This edema so increases intracranial pressure that the patient succumbs to a cerebral anemia. Is it not reasonable to postulate that by this dehydrating process the edema may be controlled and the patient tided over that critical period when he is on the verge of a medullary collapse? The thought is at least appealing and worthy of consideration.

**CISTERNAL PUNCTURE.** Since the introduction of the method a year ago, Ayer<sup>16</sup> has punctured the cisterna magna forty-three times in twenty patients for diagnostic and therapeutic purposes. The cisterna magna was punctured alone in some instances in others in combination with lumbar or ventricular puncture. There seems to be a good deal of appre-

<sup>16</sup> Archives of Neurology and Psychiatry, November, 1920, No. 5, vol. iv.

hension on the part of the timid, because of the possibility of injury to the medulla, but with a little experience and practice on the cadaver the technic is not hard to acquire. I have not found it any more difficult than lumbar puncture. Of particular interest was the suggestion by Ayer to use cisternal puncture and lumbar puncture, combined for the diagnosis of cord compression. Both pressures may measure the same when the two needles are introduced but after a small amount of fluid is withdrawn the pressure in the lumbar region will be much lower than the cisternal needle. Ayer has employed the method in the treatment of cases with spinal subarachnoid block and as a route of serum injection in epidemic meningitis. The following is the technic:

"The patient is placed on the side, as if for lumbar puncture, with neck moderately flexed. Care is taken to maintain the alignment of the vertebral column to prevent scoliosis and torsion, and in cases where comparative pressure readings are important, the lumbar and cisterna needles should be on the same horizontal plane. After antiseptic preparation of the skin, usually including the shaving of a little hair, and local anesthetization with procain, the thumb of the left hand is placed on the spine of the axis, and the needle inserted in the midline just above the thumb. The needle may be pushed rapidly through the skin, but should then be cautiously and guardedly forced forward and upward in line with the external auditory meatus and glabella, until the dura is pierced. If the cisterna be entered at this angle, there is usually a distance of from 2.5 to 3.0 cm. between dura and medulla as shown on frozen sections; with the needle less oblique in position, the distance between the walls of the cisterna becomes progressively less. Therefore, it is good practice to aim a little higher than the auditory meatus, and if the needle strikes the occiput, to depress just enough to pass the dura at its uppermost attachment to the foramen magnum. At its entrance, the same sudden "give" is felt as in lumbar puncture.

"The needle employed is a regular lumbar puncture needle, nickeloid, 18 gauge preferred, with bevelled stylet, sharp on the sides but not too sharply pointed. There is rather less variation in the depth of the tissue traversed than in the lumbar region, being in an ordinary sized adult from 4 to 5 cm. the greatest distance in the series being 6 cm. and the smallest 3.5 cm. It was found that a faint circular scratch on the needle, 6 cm. from the tip, was entirely satisfactory in judging the distance, and was preferable to the deeper markings of the Patrick needle which tend to make its insertion a little jerky and consequently less guarded."

I rather like the idea of Caldwell<sup>17</sup> for measuring intracranial pressure, although some of his criticisms of existing manometers do not hold true. The Landon manometer for all practical purposes is perfectly satisfactory. The loss of one or two drops before the manometer is attached is a matter of little moment. Caldwell's needle is constructed with a by-pass so that the fluid can enter a glass millimeter tube before the stylet is altogether withdrawn. This, of course, prevents the escape of any fluid before the stylet is withdrawn. It would seem just as feasible

<sup>17</sup> Journal of the American Medical Association, No. 14, vol. lxxiv.



to attach the mercury manometer as the glass millimeter tube to the by-pass and I think it is a very distinct advantage to standardize the recording of pressure measurements. We should register them always in terms of mercury and for this purpose the Landon manometer is the most practical and most efficient.

**Pituitary Body.** In watching the development of pituitary surgery, it is rather interesting to watch the pendulum swing back and forth in the choice of operations between the transfrontal and transsphenoidal approach. While I wavered between one and the other at different times, I have now pretty settled convictions as to what our program should be. Given a case of pituitary disorder, with threatened vision, I proceed at once with a sella decompression. This can be done with reasonable safety. If there is later a recurrence of symptoms, employ radium and x-ray emanations under the direction of an experienced operator. (Lately I advocated the use of these agencies as part of the postoperative program in the role of prophylaxis.) Should later there be a relapse, there remains the transfrontal operation with its opportunity for dealing more radically with the growth. This is the program I now advocate although well aware of the arguments in favor of the intracranial method as the operation of choice in the first instance. These arguments will be discussed later in reviewing Heuer's paper.

I have never favored any but the transfrontal or transsphenoidal approach. The transthemoidal route, although perhaps more direct, has many disadvantages, and is not popular. Those who use it employ Chiari's technic. Henschen and Nager<sup>18</sup> report a successful outcome in a single case.

Heuer<sup>19</sup> has given us a very practical discussion which I have read with much interest and profit. He uses the material he has had under his observation and his own operative experience to make out a case for the intracranial *versus* the transsphenoidal approach in the treatment of pituitary lesions. I am more than pleased with the effort he is making to popularize the intracranial method, as from the first I have been in the minority in calling attention to the advantages of the intracranial method, and yet, although Heuer presents some very telling evidence, I cannot without reservations endorse his position. The basis of his argument rests upon the physical conditions attending the growth of pituitary lesions. He contends that the growth of pituitary lesions is as much upward as downward. The mere fact that the sella has so deepened as to encroach upon the sphenoid sinus does not imply that the lesion has not grown as much in an upward direction beyond the confines of the sella. His experience with the intracranial approach has demonstrated further, (1) that before the floor of the sella turcica has been eroded and even before the posterior clinoid processes have become destroyed, the hypophyseal lesion has broken through the diaphragm of the sella turcica and become an intracranial growth; and (2) that even though the floor of the sella turcica is removed by early operation conducted through the nose, the lesion will not, or only to a slight extent,

<sup>18</sup> Correspondenz-Blatt f. Schweizer Aerzte, No. 36, vol. xlix.

<sup>19</sup> Archives of Surgery, No. 2, vol. i.

grow downward, but will, in spite of these measures, grow upward into the intracranial chamber. It seems evident therefore, that the diaphragma sellæ offers little resistance to the growth of hypophyseal lesions and that their growth is primarily and always in greatest extent upward and into the intracranial chamber.

Furthermore, while pituitary lesions may grow directly upward, backward, laterally and forward, by far the majority of the intracranial extensions are forward. In 20 out of 22 cases the growth was forward, in front of the chiasm, and between the two optic nerves.

In discussing the choice of method in earlier communications, I have often emphasized this point, that while the pressure upon the optic nerves may be temporarily relieved by a sella decompression, the surgeon cannot acquire by this operation any impression of the size or extent of the lesion. What he may scoop out with a curette may be a relatively small portion of the growth. This point, I am glad to see, is substantiated by Heuer's observations.

The technic he employs is best given in his own words; "An osteoplastic flap is turned down over the frontoparietal region on the side presenting the greatest visual or other neighborhood symptoms. The flap should be large in order to permit more easily later cerebral dislocation. A dural flap is reflected concentric with the bone flap. Should the brain be under tension, a ventricular or lumbar puncture is performed before the base of the frontal lobe is elevated. The approach to the chiasm is neither a direct frontal nor a temporal, but midway between the two and along the posterior margin of the anterior fossa. It is the shortest approach to the chiasmal region. The posterior part of the base of the frontal lobe is elevated and the chiasm brought into view. The hypophyseal lesion, if such it be, will immediately present itself. It has lifted the chiasm and come forward over the anterior margin of the sella turcica between the optic nerves. The extent of the growth and its relations to the internal carotid arteries can readily be determined. The portions of the lesion that appear, be they solid tumor or cyst, are removed, after which the sella turcica can be entered through the space between the uplifted chiasm and the anterior border of the sella. In the presence of suprasellar lesions, a different picture presents itself. The optic chiasm is depressed, not elevated as in chiasmal lesions. The part of the lesion that appears is behind the chiasm, yet if it is a cyst it can be successfully attacked. In the large lesions, the downward extension may actually be seen occupying the sella turcica."

In every case he has explored the sella turcica and removed wholly or partly its intrasellar portion. In this otherwise practical discussion, I am sorry the author has not given us more details as to how he has dealt with the lesion. The implication that in some cases he has removed entirely the intrasellar contents arouses in one's mind the question of the tolerance of the patient to the total removal of the pituitary. We have been led to believe that life without pituitary substance cannot be sustained. This is a very practical, fundamental point, and, for our enlightenment, minute details should be given of all cases in which the intrasellar portion is wholly removed,

In considering choice of method, the mortality cannot be overlooked. It is a vital consideration. Heuer's primary mortality, including several secondary operations, was 47 per cent. Considering the condition of his patients, many no doubt unpromising subjects, this mortality may not be high, at the same time I cannot endorse any operative procedure with a mortality approximately 50 per cent. unless performed in the hope of preventing immediate death, as in cerebral abscess. (It is only fair to say in this discussion that in Heuer's series a number of his patients had had transsphenoidal operations before they consulted him.) For this reason, I will continue to advocate my present program for dealing with pituitary lesions, that require operation. (1) Sella decompression; (2) in the event of recurrences, *x*-ray and radium; (3) in ultimately uncontrolled cases, an intracranial operation.

The causes of death in Heuer's series were as follows:

8 within twelve hours, due directly to operation, including 3 due to shock and 2 to cerebral edema.

3 to signs of cerebral edema (hyperpyrexia, stupor, unconsciousness, rapid pulse, respiratory retardation).

1 extradural clot (fourth day).

1 suddenly thirteen days after operation.

1 pulmonary and cerebral embolism (fourteenth day).

2 hypophyseal deficiency (fifth day).

1 internal hydrocephalus (forty-sixth day).

Of the postoperative complications, the following were observed: Injury to the olfactory nerve (2), laceration of optic nerve (1), rupture of internal carotid artery (1), rupture of anterior cerebral artery (2), convulsions (3), hypophyseal deficiency, weakness of face, arm or leg (3), speech defects (2), cerebral edema (2), hyperpyrexia commonly stuporous lethargy (6), excessive thirst (3), excessive hunger (2), hypophyseal deficiency.

Among other observations may be noted the following: The majority of hypophyseal lesions are adenomata (80 per cent. solid, 20 per cent. cystic). The absence of visual disturbances and destruction of the clinoid processes are no index that the hypophyseal lesion has not broken through the sellar diaphragm and become an intracranial growth: that with visual disturbances and destruction of the clinoid processes the lesion is invariably an intracranial growth. The differential diagnosis between primary intrasellar and suprasellar lesions at certain stages is very uncertain.

Heuer's conclusions are summarized as follows: "Chiasmal lesions are quite accessible by an intracranial approach. The cystic tumors, whether hypophyseal or suprasellar, are, however, prone to recur, and we have not as yet been able by an intracranial approach to prevent their recurrence. The solid hypophyseal tumors, excepting the rare posterior extensions, may be removed; when large, their removal has been attended by a high mortality; when small, by a much lower mortality. The true lesions of the optic chiasm are so few that they need not seriously be considered. Yet they are capable of removal, and in our single case the patient lived for four years quite free from symptoms.



The suprasellar solid tumors have thus far in our experience been impossible to remove completely; yet in one instance by a partial removal, we cured an internal hydrocephalus causing marked pressure symptoms, and the patient is still living and free from symptoms five years after operation.

"As to the choice of operative procedures in patients who present signs of chiasmal lesion, we would suggest that both the transsphenoidal operation and an intracranial operation, such as we have used, have a field of usefulness. In the early cases which present sellar headaches and evidences of secretory derangement but without visual disturbances or destruction of the clinoid processes of the sella turcica, a transsphenoidal operation may well meet the requirements. A certain number of these patients may remain well for long periods; a fairly large number will sooner or later develop an intracranial extension of the growth, causing visual disturbances and destruction of the clinoid processes. Just as soon as these signs appear, the transsphenoidal approach will fail to deal adequately with the lesion; and rather than repeat this procedure, it would appear wise to resort to an intracranial operation. For all other chiasmal lesions which at the time first observed are associated with visual disturbances and alterations in the shape and size of the sella turcica, the intracranial operation is the operation of choice; for in these we know that an intracranial tumor is present.

As intimated in the introductory paragraph, I have come to rely on radium and  $x$ -ray as important aids to surgery. At the International Surgical Society, which convened in Paris this year, I<sup>20</sup> reported my experience with radium in the treatment of tumors of the central nervous system including the pituitary body. Among other cases, I recorded the following in abstract:

Recurrence of headaches and visual disturbances nineteen months after a sella decompression. Following a course of glandular feeding,  $x$ -ray and radium therapy, there was a disappearance of scotomata, restoration of normal vision and reestablishment of menstruation. There was no recurrence three years after treatment was instituted.

Female, aged thirty years, consulted me November 27, 1917. Nineteen months before she had been operated upon (sella decompression) in another clinic for disturbances of vision due to an intrasellar pituitary lesion (struma).

Clinical examination disclosed the following: Amenorrhea had been present for three years and still persists; aggravation of headaches; ocular disturbances, right eye, vision 6/6, left eye, vision 6/9; scotoma in both right and left eyes.

*Treatment.* Radium and  $x$ -ray therapy; thyroid and pituitary feeding.

Final observation, June, 1920. Headaches are not so severe, menstruation has been established after cessation of six years. Scotomata in both eyes have entirely disappeared. Vision is normal.

The treatment in this case was inaugurated over three years ago as a

<sup>20</sup> Surgery, Gynecology and Obstetrics, September, 1920, No. 3, vol. xxxi.

therapeutic venture; since then, and particularly in the past year, there have appeared a number of clinical reports which I believe have established the reliability of radium and  $x$ -rays in the treatment of pituitary lesions. The technic will be of interest only to the roentgenologist, but I will briefly review the results.

From the clinic of Jaugeas<sup>21</sup> comes the report of 2 cases treated by  $x$ -rays. In 1 of these the treatment began in 1914, and the case is regarded as cured. The acromegaly has not retrogressed but has been arrested; vision is better now than when the patient was first dismissed. The other case, under treatment only two years, has normal vision. By watching the effect on vision, we have a means of determining effect of dosage with great precision, much more so than in  $x$ -ray treatments in other deep-seated structures. When the symptoms reach the stationary phase, Jaugeas thinks the treatment should be suspended, and cautions us against the indiscriminate use of  $x$ -rays which might lead to functional deficiency.

Webster<sup>22</sup> tells us that the best results should be anticipated in the early stage, when the process is a simple chromophil hyperplasia and before secondary tumor-like formation and skeletal changes. He reports one case with improvement after 16 treatments, and recurrence two years later. The patient meanwhile, however, had not continued under observation.

Further encouragement comes from Bécélère<sup>23</sup> who also emphasizes the importance of beginning the treatments early. This is true particularly of the visual disturbances. His case reports are very convincing. With the exception of my own report, the only other on the effect of radium comes from Quick.<sup>24</sup>

In discussing the relative advantages of radium over surgical therapy for pituitary disorder, Quick<sup>25</sup> writes that surgery has been "conspicuous by its high operative mortality" and by "operative mortality" he implies I suppose 10 or 12 per cent., but he fails to realize, at least he makes no mention of, the mortality in his own series, which was  $33\frac{1}{3}$  per cent.; one of his 3 patients died of meningitis. If radium therapy implies the introduction of radium needles into the lesion, I believe, in the long run, it will be found that the mortality of the radium treatment will be quite as high, if not higher, than the simple sella decompression.

After building up a case against surgical treatment as in favor of radium therapy by a curious process of reasoning, or perhaps without any reason, Quick concludes his discussion with this recommendation: "we now believe that it would have been a distinct advantage to have gone one step further" (this implies the removal of the floor of the sella as well as the floor of the sphenoid sinus) "and removed a window from the floor of the sella thus exposing the gland directly." In a word, he recommends a sella decompression as an essential feature of his radium

<sup>21</sup> *Journal de Radiologie et d'Electrologie*, Paris, No. 11, vol. iii.

<sup>22</sup> *Archives of Radiology and Electrotherapy*, London, January, 1920, No. 8, vol. xxiv.

<sup>23</sup> *Médecine*, June, 1920.

<sup>24</sup> *Archives of Ophthalmology*, May, 1920.

<sup>25</sup> *Ibid.*, 1920, No. 2, vol. xlix.

treatment. After all, that is practically the plan which I have adopted in the management of my cases at the University Hospital. In other words our program is as follows:

The first step should be a sella decompression, the second step a prophylactic course of radium plus  $x$ -rays, the third step, in the event of recurrence of symptoms, continuation of the radium and  $x$ -ray treatment, reserving as the last step, should it become necessary, an intracranial operation by the transfrontal route.

The 3 cases, which Quick reports, I present in abstract:

The first case had had two operations, 1 thirteen months and 1 one month before radium was applied. In each case the operation was a sella decompression. When the case was reported, nine months had elapsed since the treatment was begun, during which time the patient had received three courses of treatment. In the first, 15 mc. were imbedded through trocar needles in the lower portion of the tumor and left there. In the second, 30 mc. were imbedded inclosed in a rubber tube, into the space beneath the gland. In the third, two capillary tubes of emanation, total 3.2 m.c., were imbedded in the tumor as in the first treatment. The result at the time of the report was satisfactory in that vision had improved and headache, vertigo, nausea and vomiting were relieved.

The second case was reported fifteen months after the patient had received two treatments, one 40 m.c. of radium emanations placed against the floor of the sella after a submucous resection and removal of the floor of the sphenoid sinus; the second, 605 m.c. applied over the right temporal region 4 cm. from the skin for a period of five hours; this dosage being repeated the following day over the left temporal region. There was some improvement in vision and the headache was lessened but did not disappear.

In the third case, after a second operation (sella decompression) the case was treated by radium needles imbedded in the tumor. The patient died from meningitis.

Duffy,<sup>26</sup> has made a very exhaustive study of hypophyseal duct tumors. He has found in literature the reports of 14 cases, since Jackson compiled his series of 38 cases in 1916. His conclusions embrace many points of general and practical import.

"Although there are embryologic possibilities for growth of squamous epithelial neoplasms between the pharynx and the sella turcica, the great majority of such tumors develop from squamous epithelial embryonic rests of the hypophyseal duct either in the infundibulum or beneath the upper surface of the anterior lobe of the hypophysis. Of either origin the tumor usually presents above the sella.

"In view of the fact that a majority of these tumors are suprasellar in position from the beginning and that nearly all early assume this position, it appears that they are especially suitable surgically for an intracranial approach. In tumors which arise beneath the capsule of the

<sup>26</sup> *Annals of Surgery*, November and December, 1920, Nos. 5 and 6, vol. lxxii.



anterior lobe, the latter becomes flattened out below and a transsphenoidal approach may destroy the entire anterior lobe of the hypophysis.

"The tumors derived from embryological remnants of the hypophyseal duct are quite different in structure from those derived from Rathke's pouch or cleft (between the anterior and posterior hypophyseal lobes). From the duct reliquii develop papillary squamous epithelial cysts and solid and cystic, frequently calcified squamous epithelial adamantinomatous tumors; whereas, from Rathke's pouch or the cleft develop simpler cysts lined by a single layer of ciliated cylindrical epithelium.

"The hypophyseal duct tumors histologically may be divided into three groups: Group I is that of the papillary cyst or intracystic papilloma which is histologically the most benign example of hypophyseal duct tumors. Group II includes the uncalcified or calcified adamantinomas (solid or cystic) the rarer tumors which closely resemble the basal epithelioma of skin and the more complicated adamantinomas, the 'autochthonous teratomas' of Ewing. The tumors of this group may show criteria of local malignancy, but do not metastasize. Group III comprises a very rare group of cases which show all the earmarks of malignant spinal-cell carcinoma and may metastasize extensively to the cervical lymphatics.

"The frequent occurrence of calcification in hypophyseal duct tumors is an important diagnostic fact. At variance with the statement of Jackson that roentgenography is usually negative, in each adamantinomatous tumor described by the writer the roentgenogram showed a suprasellar calcified nodule. The rarity of such calcified shadows in tumors of other types (adenomas, endotheliomas, etc.) makes such nodular shadows almost pathognomonic.

"The occurrence of bone in hypophyseal duct adamantinomas is not due to the presence of a congenital osseous anlage but is a result of activity on the part of the stroma, apparently excited by the presence of calcium salts which have been deposited in the necrotic stratified epithelium. The mechanism of osseous change is apparently similar to that described by Nicholson for the same phenomenon in calcified cutaneous epitheliomas.

"Hypophyseal duct tumors of the infundibulum not infrequently break into the third ventricle. To the contrary, the tumors of the endyma or choroid plexus of the third ventricle are very rarely present in the suprasellar region; this is explained by spread of the growth along the intraventricular paths of least resistance.

"During operations on suprasellar cysts in intimate contact with the floor of the third ventricle microscopic demonstration of squamous epithelium from the lining of the cyst will assure the surgeon that the cyst (or solid tumor) originated below the ventricle. A pathological fact of importance for the surgeon to appreciate is the intimate and delicate relation of such cysts with the floor of the ventricle, from which they are frequently separated only by a very thin membrane.

"The very frequent occurrence of the clinical syndrome of dystrophia adiposogenitalis (Fröhlich) in patients suffering with hypophyseal duct (squamous epithelial) tumors makes the pathological findings in

the genital organs of two individuals of particular interest. In the uterus of a twenty-year-old girl there was an atrophic endometrium, almost equal to that of the senile type, associated with cessation of the process of ovulation (ovaries). The testes of a thirty-five-year-old man showed a marked atrophy of the spermatogenous epithelium."

**Brain Abscess.** Under the caption "Exclusion of the Subarachnoid Space," Lemaitre<sup>27</sup> presents an interesting series of cases of brain abscess, in which he employed the technic about to be described. On the principle that the most serious complication of the operation for brain abscess is meningitis he plans to wall off the subarachnoid space before drainage is fully established by encouraging the formation of adhesions about the drainage tract. This is accomplished with a heavy Pravacz needle, a drainage tube and a small pair of forceps. The meninges and brain are punctured with the Pravacz exploring needle presumably in the neighborhood of the abscess. A drop of pus appearing at the end of the needle is indicative that the abscess cavity has been entered and the needle is replaced with the drainage tube. Lemaitre uses at first a drain of the smallest calibre and allows it to remain *in situ* for twenty-four to forty-eight hours. After that, every twenty-four hours a tube of larger size is inserted at each dressing, enlarging the opening if necessary to 1 to 2 mm. with a bistoury. When the drainage tube has a diameter of 7 to 8 mm. drainage may be said to be adequate. By this method he has avoided the two serious complications, meningitis and hernia.

This technic was applied in a series of 5 cases of brain abscess, all of which recovered. If the series represents 5 consecutive cases of brain abscess, the record is most praiseworthy, as the average mortality is 50 per cent. But the record speaks for itself and would seem to forestall any adverse criticism. At the same time one questions the propriety of the repeated withdrawal of the drainage tube in the fear that the cavity once emptied might not so easily be relocated. This criticism would seem to be especially appropriate when the initial tubes are of such small calibre. Whatever justification there may be for this criticism, the principle on which Lemaitre's technic is founded is sound and the results speak for themselves.

The same technic may be applied to advantage in the removal of foreign bodies with, or without, abscess, and Lemaitre records a series of cases in which it proved efficacious. After the cavity has been effectually drained, he inspects the cavity with the aid of a metallic cannula (encephaloscope) and artificial illumination, and with suitable instruments, such as those used in bronchoscopy, he removes the foreign body. In a series of 11 cases of gunshot wounds complicated by abscess, foreign bodies or hernia there were three deaths.

Adson<sup>28</sup> gives us an analysis of results in 26 cases examined at the Mayo Clinic:

<sup>27</sup> Revue de Chirurgie, 1919, No. 7 and 8.

<sup>28</sup> Journal of the American Medical Association, August 21, 1920.

Cases operated upon 9; mortality 44 per cent.

Cases not operated upon, 17—7 followed operation for empyema, 5 died; 3 followed radical mastoid, 3 died; 7 died during period of observation.

**Etiology of 26 cases:**

Chronic otitis media . . . . .	5
Frontal sinusitis . . . . .	8
Injury to skull . . . . .	4
Empyema . . . . .	6
Pulmonary tuberculosis . . . . .	1
Lung abscess . . . . .	1
Bronchiectasis . . . . .	1
	— 26

**Location:**

Frontal lobe . . . . .	14
Temporal lobe . . . . .	4
Temperosphenoidal lobe . . . . .	2
Occipital . . . . .	1
Cerebellar . . . . .	2
Midbrain . . . . .	1
Subtemporal . . . . .	1
Encephalitis ? . . . . .	1
	— 26

Of the significant symptoms the following are mentioned: Headache (13), nausea and vomiting (10), Jacksonian epilepsy (12), grand mal (4), paralysis (14), hebetude or coma (16); average white cell count, 16,000; spinal fluid cell count (except in meningitis), 2 to 5 cells; choked disks (9), 1 to 7 diopeters; local tenderness (12); mental disturbance (12). Sixteen patients died in the initial stage.

**Cranial Trauma.** The opportunity to study the results of cranial trauma at autopsy would be most instructive for the surgeon. Unfortunately, the surgeon is usually not present at the autopsy, and the pathologist is not particularly interested in the practical problems. The study of his statistical reports is interesting and in a measure instructive, but the surgeon would profit much more were he able to see and examine the gross specimens when fresh. This material, if used for undergraduate instruction in the course on cranial fractures and cerebral trauma, would be invaluable. How much more would the student understand of the effects of contrecoup, of the significance of cerebral contusion, laceration and edema, of the extensiveness of intracranial hemorrhage. I have just been reading the paper by Le Count and Apfelbach<sup>29</sup> on the pathology and anatomy of traumatic fractures of cranial bones based upon an estimation of 504 cases. It contains a mass of interesting data and statistics which I cannot cover here, as to the nature and location of fracture, the degrees, incidence and nature of brain injury, and of the subdural and epidural hemorrhages. For the details I shall have to refer the reader to the original paper. Suffice it here only to comment on some practical points. For purposes of indicating the degree of injury, the authors divide them into 7 groups:

I. Severe lacerations of the brain 4 to 6 cm. in diameter and 4 to 5 cm. deep, 54 cases in all, and of these there were:

15 involving the ventricles.

39 intracerebral hemorrhages (36 frontal).

54 subdural hemorrhages.

<sup>29</sup> Journal of the American Medical Association, February 21, 1920.



II. Contusions 2 to 4 cm. deep, leptomeninges torn and lacerations 1 to 2 cm. deep: 248 cases and all had subdural hemorrhages.

III. Contusion with leptomeninges intact with 1 to 2 cm. surface lacerations and wedge-shaped hemorrhages, 35 per cent. These were the moderate traumas and in only 15 were there subdural clots weighing more than 10 grams.

IV. Superficial contusions with petechial hemorrhages in the cortex 1 to 1.5 cm. in diameter. But little hemorrhage into the leptomeninges. As in Class III, these injuries affect the brain some distance from the direct line of force.

V. Hemorrhage into the pons and medulla, centrally located with clot 1 to 3 mm. in diameter.

18 in fractures of posterior fossa.

13 out of 166 fractures of the middle fossa.

3 with fracture of anterior fossa.

5 out of 49 fractures of the vault.

VI. Small intracerebral hemorrhage usually in the cerebral ganglia, 5 to 10 mm. in diameter; 6 cases in 504 fractures.

VII. Similar hemorrhages about 1 cm. in diameter in a hemisphere compressed by an extradural clot; 4 in 104 large extradural hemorrhages.

It is rather interesting to note the large percentage of injuries by contrecoup:

Fractures of the vault, 79.59 per cent.

Fractures of posterior fossa, 83.70 per cent.

Fractures of middle fossa, 62.04 per cent.

Fractures of anterior fossa, 21.31 per cent.

Observe how the percentage falls off as the fracture approaches the anterior fossa.

The following statistics are quoted to show the frequency of subdural hemorrhages accompanying fractures.

Fracture of posterior fossa . . . 115 out of 136 cases and 104 contrecoup.

Fracture of middle fossa . . . 98 out of 134 cases and 63 contrecoup.

Fracture of anterior fossa . . . 21 out of 48 cases and 8 contrecoup.

Fractures comminuted . . . 36 out of 43 cases and 18 contrecoup.

Fractures of the vault . . . 38 out of 48 cases.

It is readily seen from this table how common an associated condition is subdural hemorrhage and in the majority of cases recorded as such the clot weighed 40 grams or more. It would be interesting to know the usual location of these hemorrhages, but this information is not given. Of the extradural hemorrhages there were 199 out of 504 fractures and half of these were large enough to cause brain compression—that means that in 2 in 5 cases of head injury we should anticipate an epidural clot large enough to justify operation. Here are some more interesting facts: of these large epidural clots:

70.19 per cent. were with fractures of middle fossa.

only 14.00 per cent. were with fractures of posterior fossa.

and 2.00 per cent. were with fractures of anterior fossa.

As to their location:

49 covered temporal and parietal lobes.

34 covered temporal and occipital lobes.

14 covered occipital lobe.

6 covered frontal and parietal lobes.

And of these

49 seemed to bleed from anterior branch of middle meningeal.

44 seemed to bleed from posterior branch of middle meningeal.

3 seemed to bleed from ventricles.

Of particular interest is this statement:

The most frequent change in patients dying from fractures of the skull is traumatic edema and in a few cases it was the only change.

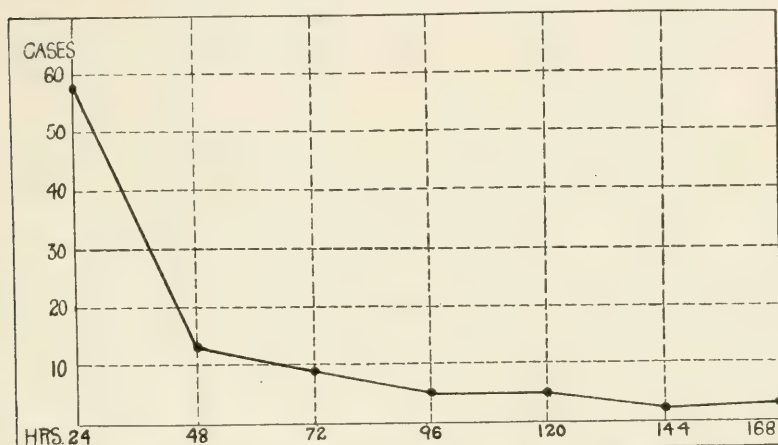


FIG. 2.—Time of death of ninety-five of the 104 patients dying with large extradural hemorrhages. Of the nine not shown in this graph, five were found dead and four died between the eighth and the twenty-second day after entrance to hospital. (Other details connected with some of these extradural hemorrhages, diagnosis, operations, etc., are given in the article by Dr. Moody.)

These two charts (Figs. 2 and 3), with their legends, convey a great deal of information. This article is well illustrated and should be read by every surgeon responsible for the care of head injuries:

Complementary to this is an article by Moody<sup>30</sup> who reviewed 547 cases of fracture, especially with reference to extradural hemorrhage. There were 100 cases, and of this number 63 were not recognized as such until post mortem, and 24 of these were in the hospital two days or more. In all but 2 of the 63 there were recorded on the clinical histories symptoms generally regarded as significant of brain compression. This is one rather startling fact. Another is this; that while all the cases in which the condition was recognized were operated upon, 37 in all, 26 died. Of the total number 100, the mortality was 89 per cent.

Salomon,<sup>31</sup> writing on the same topic, admits there are difficulties in

<sup>30</sup> Journal of the American Medical Association, February 21, 1920.

<sup>31</sup> Deutsche med. Wchnschr., No. 42, vol. xlviii.

making an accurate diagnosis in the atypical cases and if, after two or three days' observation there is little or no improvement, he advises

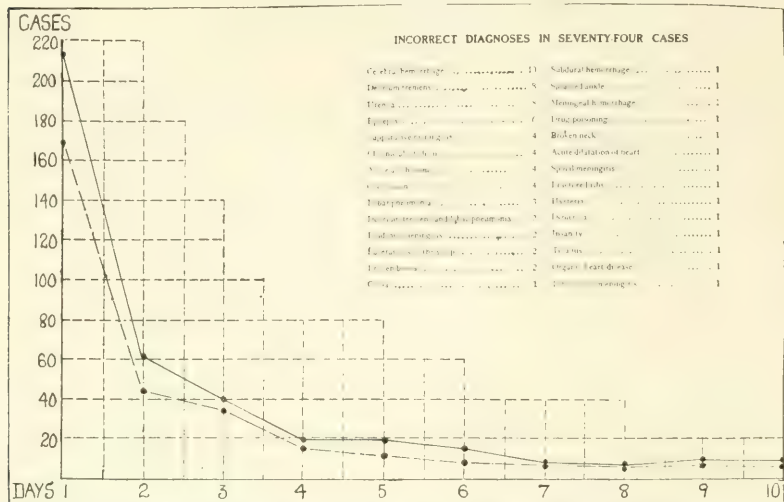


FIG. 3.—Time in twenty-four-hour periods of death from fracture of the cranial bones and brain injuries of 403 of the 504 patients (upper line), and number of correct diagnoses during the same periods (lower line). The 101 remaining are not included because the time for eighteen of them was from eleven to twenty-two days, inclusive; twenty-seven had to do with persons found dead; for thirty-eight the records were incomplete; and eighteen concerned healed fractures. Any consideration of diagnosis must take into account the time under observation. Therefore, such charts as were used by Bissell and LeCount (*A Consideration of the Relative Frequency of the Various Forms of Coma*, *Journal of the American Medical Association*, March 27, 1915, p. 1041; February 17, 1917, p. 500) are continued here.

an exploratory operation. I think he is too conservative. It ought to be possible, and it is possible in most cases of cranial injury, to come to a

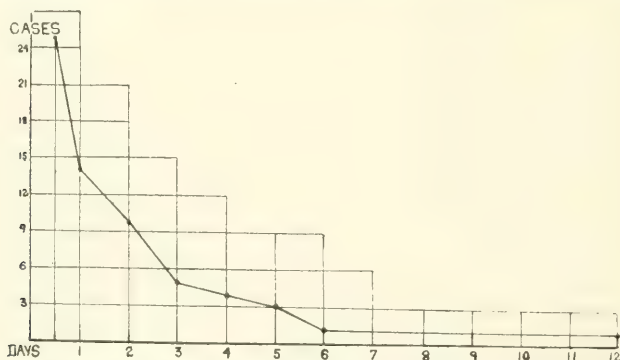


FIG. 4.—Number of days under observation of sixty-three patients with extradural hemorrhage found at postmortem examination but not recognized clinically.

decision at the end of the first twenty-four hours, or sometimes during the second twenty-four hours, whether operative interference is indicated.



There is much to be said on hasty interference, but it must not be postponed too long.

In the treatment of *compound fractures of the skull* in civil life, Sachs<sup>32</sup> applies the principle of débridement as employed in gunshot wounds of the late war. First the edges of the scalp are excised, then the traumatized dura, and, finally, with a sharp knife, the traumatized brain tissue. A fascial transplant is used to close the defect in the dura, and by a plastic on the scalp the wound is closed completely with layer sutures. As Sachs pertinently says, the drawback to his method is the sacrifice of portions of brain tissue and the resulting incapacitation. This is a serious matter and it is questionable whether such recommendation should be made without qualifications as to the nature of the injury, the presence of foreign bodies, the source of contamination, if any, etc. The mere contusion of the cortex should not, I believe, justify the removal of the damaged tissue.

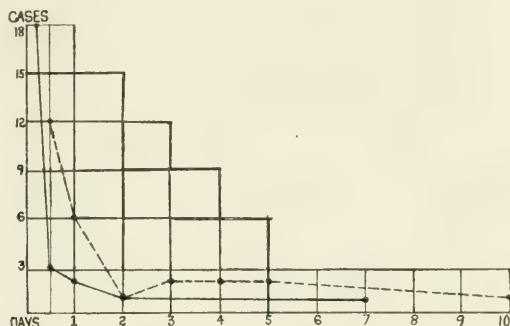


FIG. 5.—Time under observation before operation (solid line), and time between operation and death (broken line), of twenty-six patients with extradural hemorrhages, diagnosed and operated on, one patient dying on the twenty-second day with lobar pneumonia is not represented.

**Gunshot Wounds of the Head.** The war is over but many surgical problems remain unsettled, some will remain so until the world sees another conflagration. Among these unsettled problems is the technic of dealing with gunshot wounds of the brain. There were, and are, many points of disagreement.

For the removal of foreign bodies from brain cavities, finger palpation is the most rapid, sure and safe method in wounds large enough to admit a finger. With this direct and positive statement, Towne and Goethals<sup>33</sup> take issue with those who condemn this method in favor of others more indirect. One of the conditions, which influenced the writers, in advocating "finger palpation" was the nature of the lesion. From many postmortem examinations they found that the bullet track was often of considerable dimensions, really more of the nature of a cavity. Its diameter was considerably greater than that of the dural opening; the cavity was somewhat egg-shaped with the dural aperture at one point

<sup>32</sup> Southern Medical Journal, No. 6, vol. xiii.

<sup>33</sup> Annals of Surgery, May, 1920.

and the metal at the other and with showered bone fragments lying free or embedded in its walls. The lesions observed in cases that died without operation indicated that, though the impulsion of bone fragments at angles lateral to the direct course of the metal was one reason for the increased diameter, the pressure of the hematoma which invariably filled the cavity caused additional expansion.

It is evident, in reading between the lines, that the principle issue in the minds of the writers is the relative merits of "finger palpation" and the "catheter forceps" technic. The advantages of the former in the minds of the writers are chiefly threefold: there is less likelihood of foreign

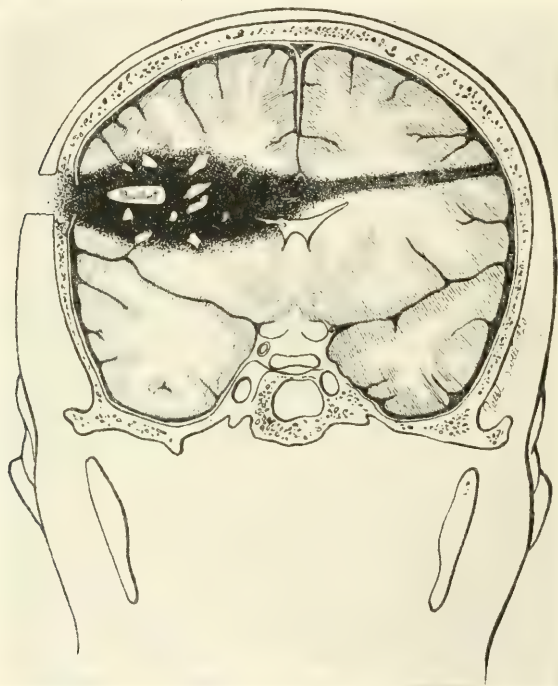


FIG. 6.—Case XVII. Diagrammatic horizontal section to illustrate egg-shaped cavity in right occipital lobe, with bone fragment in ventricle. Metallic fragment (a) was extracted through hole in falx.

bodies, either metal or bone being overlooked, the technic is easily mastered and is not time-consuming. The "catheter forceps" technic was said to be safe only in the hands of experienced head surgeons or those especially trained in this technic. The operation was a two-hour job. These two factors were serious obstacles to the performance of early and complete débridement as the only safeguard against sepsis. So much time was consumed in a single operation that others had to wait, and if the "experienced" head surgeon was not on hand, the patient had to be evacuated without operation. For these reasons, Towne and Goethals protest against the catheter forceps technic and advocate so

strongly finger palpation and this contention is supported the writers believe by a mortality of 35 per cent. in a series of 28 unselected cases. Their conclusions are covered in the following paragraphs:

1. "Entry of a foreign body into brain tissue causes irreparable damage to a more extensive area than that involved in the actual track of the foreign body, and this cavity is further broadened by hemorrhage; hence the size of the metallic fragment or of the dural aperture is not a true index to the wider area of damage represented by the brain cavity.

2. "When such a cavity is not over 7 cm. deep and large enough to admit a finger, cleaning with forceps under careful finger control gives

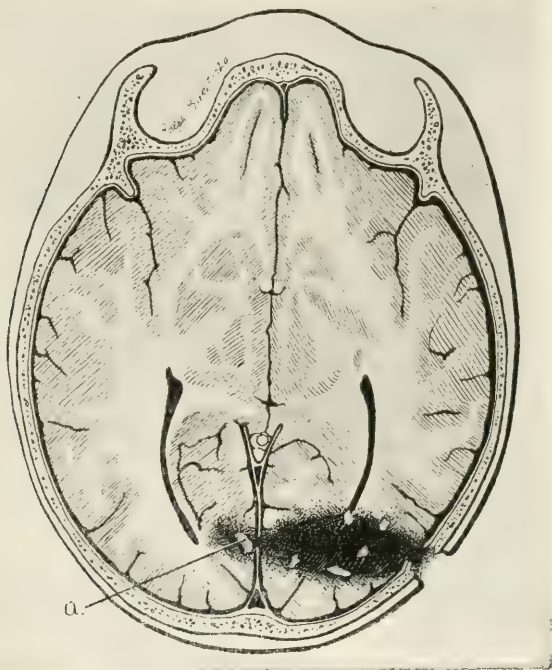


FIG. 7.—Case XXI. Diagram from sketch at autopsy. Note egg-shaped cavity in left hemisphere, open ventricle, severed anterior cerebral artery, and position of bullet before operation.

absolute insurance against sepsis, and only very rarely causes increased cerebral trauma which is slight and recoverable.

3. "Cleaning of such a cavity by Cushing's method of catheter palpation is sometimes not complete and therefore does not always prevent sepsis; it necessitates a prolonged operation; and it is successful only in the hands of those who have had a large experience in its technic.

4. "Brain wounds not suitable for finger palpation must be cleaned as well as possible by the catheter method, curettage, or magnet extraction, or a combination of these methods.

5. "The tendency of the difficult catheter technic to make this a special field, which requires that the wound undergo delay if a trained



neurological surgeon is not at hand, is not for the best interests of the patient, who is put under increasing risk of encephalitis with every preoperative hour.

6. "Brain wounds, and especially those suitable for finger palpation, are easy to clean rapidly and successfully if a few proper instruments are available. Any surgeon fitted to do front-line work can quickly acquire the technic and do these cases in well under an hour; and, with experience in judging which casualties are inoperable, may well succeed in evacuating 75 per cent. or more of his operated cases."

One of the best individual records in the treatment of gunshot wounds of the head was made by A. M. Hanson, who, despite the splendid service he rendered at the front at Evacuation Hospital No. 8, was never promoted above the grade of lieutenant. He advocated, among other things, local anesthesia, excision of the scalp wound and exploration of the skull in all cases, disinfection of the wound with ethyl alcohol and after removal of foreign bodies closure of scalp in two layers. He used the soft catheter technic, removed his foreign bodies with esquillectomy forceps, irrigated the tract with tenth normal saline solution to remove débris and pulped tissue, disinfected the cavity with ethyl alcohol, and the patients were not moved for six weeks. He took care of 327 cases altogether and his mortality is recorded thus: scalp wounds, 0; skull fractures with dura intact, 3.9 per cent.; craniocerebral, sinus and craniocerebral injuries, 44.2 per cent. His operative mortality may be quoted as evidence of his exceptional record:

Excision of scalp with exploration of skull, 213 cases; mortality, 3.7 per cent.

Trephinations of skull, 105 cases; mortality, 31.4 per cent.

An interesting analysis was presented by Wagstaffe<sup>34</sup> to the Interallied Surgical Conference. It included a total of 740 cases. The report abounds in statistical tables to which the reader is referred for information in detail. One is struck, however, with the extraordinarily high percentage of the cases of disability and with the fact that in the majority of cases the incapacity was due to subjective symptoms. In many instances the subjective symptoms became more rather than less pronounced as time passed. In fact, in many instances the subjective symptoms, especially headache and vertigo, did not develop until from three months to a year after discharge. Only 50 per cent. were free from these subjective disturbances. Of the 740 cases, 195 died in France; and of the 545 evacuated to England, the great majority were discharged totally incapacitated. The totally incapacitated include 93 per cent. of cases with dural penetration, 68 per cent. of these without dural penetration, and 38 per cent. of these with only wounds of the scalp.

**Cranioplasty.** Of those who survived the immediate effects of gunshot wounds, many returned to the States with cranial defects and many of these, in turn, not all by any means, presented a rather definite clear-cut picture. Coleman<sup>35</sup> describes these very well in the following words: The patient complains of throbbing and pulsation about the defect,

<sup>34</sup> Arch. Méd. et Pharmacie, Militaire, vol. lxxii, p. 153.

<sup>35</sup> Surgery, Gynecology and Obstetrics, July, 1920.

vertigo upon exertion, a feeling of insecurity, and particularly of the dread of injury to the unprotected brain. Any sudden change of position, such as stooping over, a sudden movement of the head, or coughing

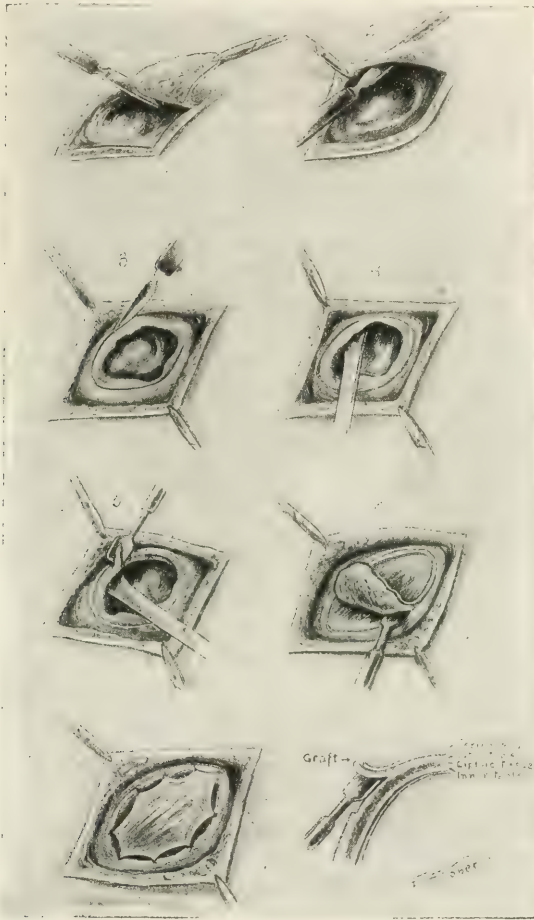


FIG. 8.—Consecutive stages of operation. 1. Excision of scar from defect. 2. Exposure of rim of defect by incision through scar. 3. Incision through pericranium about a quarter of an inch from the edge of the defect. The purpose of the incision is to provide for bone contact with the graft and to free the adherent dura. 4. The pericranium within the incision, 3, is forcibly displaced within the defect by an elevator. Adhesions of the dura to the edge of the bone are thus freed. 5. Beveling the edge of the defect for contact with the graft. The dura is carefully protected by a thin spatula. 6. Removal of the transplant from the parietal eminence. The size and shape of the transplant has been modelled by rubber dam and the graft cut to fit accurately. 7. Shows graft partly sutured by uniting the pericranium of the graft with that surrounding the defect. 8. Cross-section of graft.

may be followed by one or more of the symptoms. These patients are disinclined to physical exercise, and often suffer from disturbed sleep because of the throbbing or vertigo when lying down in bed.

Kerr<sup>36</sup> calls this the "defect syndrome" and gives pretty much the same picture: They are morose, retiring, and avoid their fellows. They suffer more or less from headache. Stooping over or turning suddenly will produce dizziness. Loud noises are extremely irritating. Exposure to the sun produces headache and prostration. Perhaps the fear of injury and knowledge of incomplete protection to their brains contribute to this characteristic train of symptoms. There is a definite disability from skull defect that is absolutely independent of any accompanying neurological lesions.

The operation, cranioplasty, was frequently practised for the repair of these cranial defects to accomplish two main purposes: (1) protection of the brain, and (2) correction of the deformity but there is also, as Coleman points out, a decided improvement in the patient's general condition. The aversion to physical exertion disappears, the discomfort arising from pulsation, throbbing and dizziness or sudden movements is relieved and the patient undertakes with great optimism his reëducational exercises. This, I think, is a very fair statement of the results of operation in this group.

Coleman uses the "autogenous cranial transplant" after the method I have employed for many years in civil practice, and, from personal observation, his results I know were excellent. The essentials of the technic may be followed in the illustrations. Kerr uses practically the same technic, but calls it by a different name, "the osteoperiosteal graft of Delangière." Kerr prefers local anesthesia and sews the graft with the "bone surface upward."

Those who may be interested in the general problem of reëducation of cortical or subcortical centers, after injuries with definite structural lesions, will be interested in reading Kerr's article.

MacLennan<sup>37</sup> prefers the scapula to the skull because he says it causes no disability and is eminently suited for the operation. He places the graft entirely within the skull in contact with the inner table.

**Subtemporal Decompression.** It seems to me that Cushing's technic for subtemporal decompression meets every requirement. There are a good many general surgeons who do subtemporal decompressions with the notion that after all this is one of the cranial operations that does not require a neurological surgeon, and so, without giving much thought to details, the results in many instances are rather distressing; ten big, unsightly protrusions with more or less functional disturbances (weakness of arm or leg, etc.). The subtemporal decompression is most serviceable as a temporary expedient, to relieve pressure in the crisis of an intracranial trauma, while awaiting signs of localization in brain tumors. For undisputed inoperable growths, the degree and duration of relief is somewhat disappointing. But, to come back to the technic, Cathey<sup>38</sup> wants us to modify the technic on a plan which acts in establishing "*permanent drainage and a permanent decompression.*" These words sound big and look very well in print, but I do not think they mean

<sup>36</sup> Surgery, Gynecology and Obstetrics, June, 1920.

<sup>37</sup> Glasgow Medical Journal, 1920, xi, 251.

<sup>38</sup> Northwest Medicine, 1920, xix, 126.



much. I do not believe, for example, that the cerebrospinal fluid which escapes through the decompression opening is readily absorbed in the muscle tissue, or, in fact, that it continues to escape from the brain but for a short time, a few days, a week or so, not longer. Adhesions soon form around the dural incision, which shuts off the subdural and sub-arachnoid space and, presto! the "permanent drainage" is a closed chapter. So that it is not necessary, or desirable, to carry out the elaborate technic which Cathey recommends. His dural flap is converted into a tube and forced into the temporal muscle beneath the zygoma where it acts as a *permanent* drain. The margin of the dural wound is cut in stellate fashion and the flaps turned over the edge of the skull and stitched to the pericranium. Thus reformation of the skull is prevented. Let us continue our decompressive operations as before with especial attention to two points: (1) the attachment of the temporal muscle to the temporal ridge should not be detached, (2) the wound in the temporal muscle and aponeurosis should be closed with meticulous care, using silk suture at  $\frac{1}{2}$  cm. intervals.

**Brain Puncture.** Brain puncture I thought had been buried. Someone with more faith than reason persists in resurrecting it every once in a while. This time it is Paetsch<sup>39</sup> who is surprised that so few still practice brain puncture for diagnosis and fewer for therapeusis. He recites his experiences with 2 cases of cerebral trauma in which he withdrew blood, with relief of symptoms, and a case of brain tumor in which he circled the head with punctures, localizing signs failing; first in the right frontal lobe then in the left, later in the right cerebellum and then in the left; in the last puncture, he withdrew 40 c.c. of amber fluid. Presumably he had tapped a cyst. For eight years he has been tapping this cyst, always with temporary relief of symptoms.

**Hydrocephalus.** Dandy,<sup>40</sup> continuing his interesting studies on hydrocephalus, devotes his last paper to the diagnosis and treatment of those cases which are due to strictures of the aqueduct of Sylvius. Taking all cases of congenital hydrocephalus of the obstructive type, he estimates two-thirds as due to obstruction at the aqueduct of Sylvius and one-third to obstruction at the foramina of Magendie and Luschka. For the former group he proposes an operation, which relieves the constriction and attempts to reconstruct the obliterated aqueduct. He has performed the operation twice on children one year and five years of age; one child died in the seventh week and the other was living when the report was prepared. The steps of the operation are as follows:

After a bilateral exposure of the cerebellum, the vermis is elevated with a small spatula, exposing the normal foramen of Magendie and the fourth ventricle. Into this a fine catheter is gently passed forward until it is met by the obstruction at the aqueduct of Sylvius. To get a satisfactory exposure, it is necessary to divide the lower half of the vermis in the midline and carry this incision through the roof of the fourth ventricle. A nasal dilator introduced into this defect permits a good exposure of the funnel-like anterior terminus of the fourth ventricle

<sup>39</sup> Therapeutische Monatshefte, Berlin, Bd. xxxiii, No. 8.

<sup>40</sup> Surgery, Gynecology and Obstetrics, No. 4, vol. xxxi.

and the entrance to the aqueduct of Sylvius. A small sound entering this orifice meets the obstruction and is carefully forced through it into the third ventricle. Fluid at once freely escapes through the opening which again establishes communication between the third and fourth ventricles. Larger sounds are then passed to increase the size of the

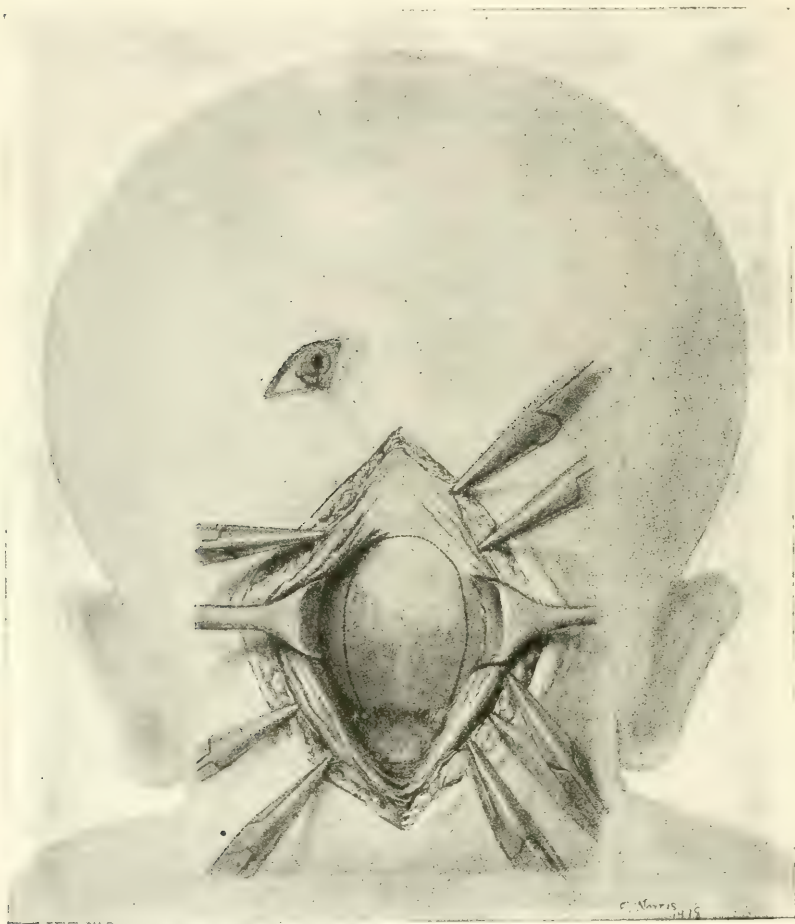


FIG. 9.—This and the succeeding drawings by Miss Norris show the operative procedure, in which the stricture of the aqueduct of Sylvius is opened and enlarged and the tube inserted to maintain the opening. In this figure the wound is shown. The occipital muscles are separated in the midline and the bone exposed. A ventricular puncture is made to reduce the intracranial pressure.

lumen. A small rubber catheter is pushed into the newly made channel and left in position for a period of two to three weeks after the operation. The tube is perforated in numerous places to prevent closure of the lumen by fibrin. The walls of that part of the tube which lies in the aqueduct are smooth and are without perforations. The anterior part of the tube projects into the third ventricle, the posterior part is in the

fourth ventricle and lies in the pons and medulla. It is anchored with a silk ligature to the dura at the foramen magnum. The end of the tube is cut off at this point and the lumen closed by a ligature. The excess tube which traverses the entire length of the fourth ventricle is necessary to preclude the possibility of the tube becoming dislocated and lost. The nuchal muscles are carefully closed over the wound, thus deeply burying the large foreign body and preventing skin complications in the superficial wound during its abode in the brain.

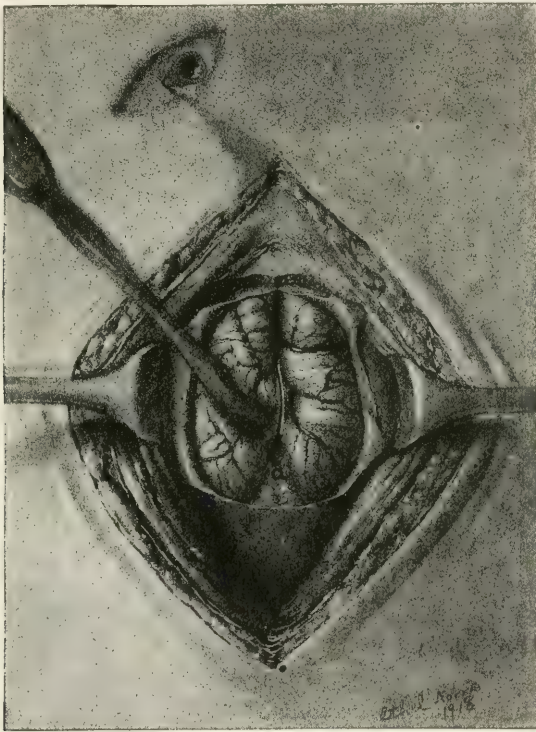


FIG. 10.—The cerebellum is exposed. The cerebellum is lifted and the foramen of Magendie exposed *a*. The line in the vermis indicates the site for section of the posterior part of the cerebellum.

Before the operation is undertaken, one must remove any doubt as to the type (obstructive) and as to the site of obstruction. The former is readily determined by the phthalein test, the latter on the operating table. Patency of the foramen of Magendie is readily determined, and patency or occlusion of the foramina of Luschka is of less importance, since one foramen is adequate for drainage. If the foramen of Magendie is patent, the occlusion by elimination must be at the aqueduct of Sylvius. Having determined by the phthalein test that there is an obstructive lesion, the precise location may be determined by ventriculography. If the obstruction is at the aqueduct of Sylvius, the shadow of the third, and particularly the lateral, ventricle will be shown to be



greatly dilated, but no air will be present in the fourth ventricle. If air is in the fourth ventricle, the obstruction cannot be at the aqueduct of Sylvius. The absence of a shadow in the fourth ventricle must not be taken as conclusive evidence of an occlusion at the iter unless one is confident of a perfect injection, that is one which almost completely fills both lateral ventricles and in which the head has been properly manipulated to permit air to pass into and remain in the fourth ventricle.

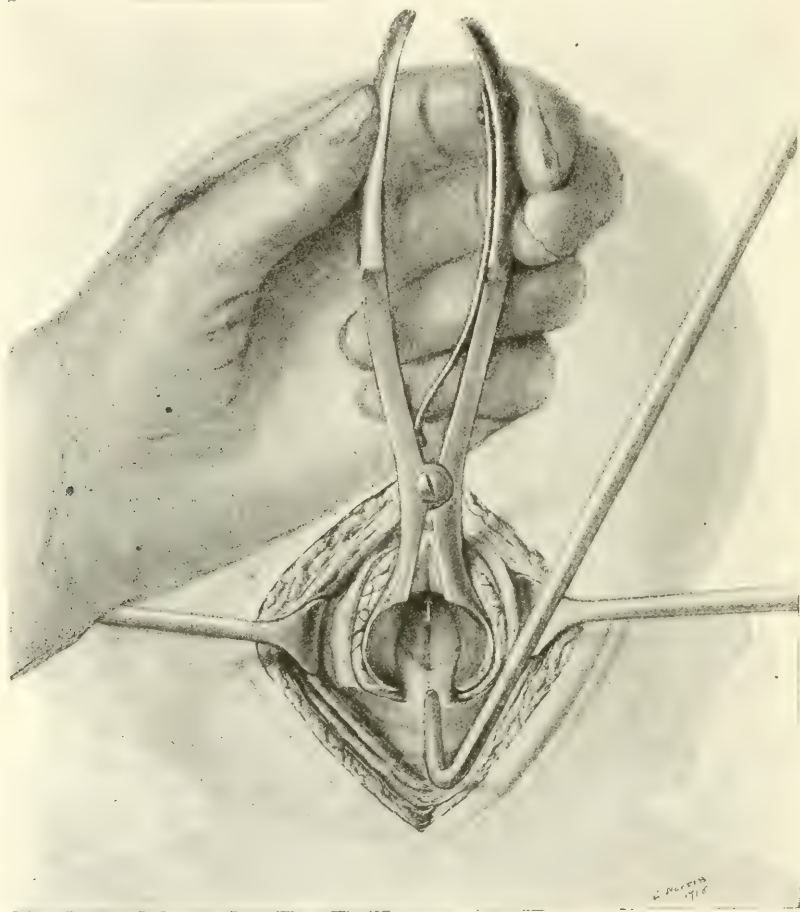


FIG. 11.—The dilator is separating the divided surfaces of the cerebellum and exposes the fourth ventricle and the beginning of the aqueduct of Sylvius.

**The Syndrome of the Brain.** *Xanthochromia associated with hydrocephalus* is quite unique in my experience. Gordon,<sup>41</sup> who observed one case, gives the following possible causes: (1) basal meningitis (meningococcus or *B. influenzae*); (2) partial recovery; (3) obstruction of foramina in the roof of the fourth ventricle by meningitis; (4) development of a

<sup>41</sup> Canadian Medical Association Journal, No. 11, vol. ix.

noncommunicating hydrocephalus; (5) hernia of the brain into the foramen magnum; (6) separation and sacculation of the spinal subarachnoid space.

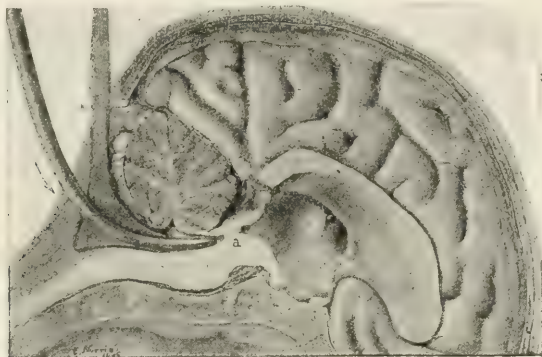


FIG. 12.—Sagittal view of brain to show stricture at the aqueduct and the method of piercing it with a steel catheter preparatory to the introduction of the rubber tube.



FIG. 13.—Sagittal view of brain, showing tube in position in the aqueduct of Sylvius. Openings are made in that part of the tube which lies in the third and fourth ventricles. The tube is firmly anchored to the dura with a silk suture at *b*. The tube is buried complete when the occipital muscles and the skin are closed.

### THE FACE.

**Paraffinoma of the Face.** Many patients have been treated for deformities, especially saddle-nose, by the subcutaneous injection of paraffin. Sometimes unsightly and disfiguring results occur and the surgeon is called upon to give relief. The subject is rarely treated and hence we welcome the opportunity to describe the experiences of Bevan.<sup>42</sup> He finds that it is always necessary to dissect out the mass with due regard for the nerve supply to the facial muscles. In the case described, in which the nose had been injected, the paraffin had been pushed into the loose areolar tissue of the left eyelid producing a chronic inflammatory mass of tissue which prevented opening the left eye. An oval incision was made under the brow above and close to the free edge of the

<sup>42</sup> Surgical Clinics of Chicago, 1920, iv, 529.

eyelid below. By cutting down to the cartilage of the lid, he found something of a line of cleavage between the wound tissue and the involved tissue, but the cartilage had to be hugged pretty closely. At the angle between the eyelid and orbit, the paraffin was removed best by means of a sharp chisel. Care was exercised not to injure the tear duct, and between the eyelid and nose it was again necessary to resort to the chisel. The raw space on the upper lid was covered with two Thiersch grafts from the arm.

Davis<sup>43</sup> also reports a case, and describes the pathologic effects of the paraffin upon the tissues. He concludes: "that paraffinoma is a chronic granuloma produced by prolonged, continuous exposure of susceptible tissues to the irritation of paraffin. Disfigurement, deformity and interference with function, if the lesion is in a region requiring motility, are the chief types of disability resulting; cancerous degeneration, 'wax cancer,' is an occasional intruder. Complete extirpation of the involved tissue is the treatment of choice. Paraffinoma probably is not the expression of a specific growth-inciting property of paraffin, but is rather the result of the long-continued action of a low grade chemical irritant."

**Rhinophyma.** Seelig<sup>44</sup> writes a very clever paper on this affection, most of which concerns itself with the historical aspect. He quotes, from a forthcoming book by Engman, the conclusions of an intensive study: "Rhinophyma is a familial disease representing some type of hereditary transmission. It occurs usually in the seborrheic type of individual. (The seborrheic type of Sabouraud may be described as an individual with yellowish-tinted, muddy, thick skin, the yellowish tint being most pronounced around seborrheic areas, with a tendency to acne vulgaris in youth and acne rosacea in middle life.) The future of a rhinophyma subject shows a tendency toward flushing of the face on entering a warm room, after meals, or under excitement. This flushing leads, in time, to a chronic congestion, with secondary chronic infection of the skin of the nose and sometimes of the cheeks. This, in turn, leads to a chronic productive inflammation, with vascular dilation, connective-tissue formation, and dilation of the sebaceous glands into cyst formations. There is a marked thickening of the cutis vera, which throws the skin into folds and furrows. The end-result is the multiple formation of knobs or tumor-like masses."

Last year I described a rather complicated operation devised by Fuld<sup>45</sup> and referred to Gibbon's paper in which the paring method was advocated. Seelig has a very nice description of the operative technic. He condemns the wedge-shaped excision methods and prefers the shaving off of the redundant tissue until the nose is brought back to what one assumes was its original form. In this shaving process, two things should be borne carefully in mind: (1) Do not shave too deeply, and (2) preserve a thin rim of epithelium around the nares. If the shaving is carried too deeply, we remove all sebaceous gland rests and leave no niduses of epithelium from which, as brood centers, epithelization may

<sup>43</sup> Journal of the American Medical Association, 1920, lxxv, 1709.

<sup>44</sup> Surgery, Gynecology and Obstetrics, 1920, xxx, 394.

<sup>45</sup> PROGRESSIVE MEDICINE, March, 1920, p. 50.



spread. This delays healing, and even if the nose be grafted, the resultant skin has a harsh, white, dry appearance so striking as always to command attention and cause comment. Furthermore, deep shaving may injure the nasal cartilages and set up a stubborn perichondritis. If a thin ring of intact skin is not left around the nares, serious disfigurement may result from the contractions incident to cicatrization. Hemorrhage, which is usually very free, is checked with comparative ease by simple gauze pressure, and the patient is sent to bed with a large, well vaselined gauze over his nose. The next day this pad is removed, and the denuded area is strapped with imbricated strips of sterile zinc oxide adhesive plaster. This plaster dressing is changed daily. Under this simple dressing, the patient was completely healed in ten days. It is not necessary to skin graft these patients. Indeed, von Bruns points out that grafting often leads to the development of retention-cysts underneath the grafts, with subsequent breaking through and ulceration.

In another paper on Rhinophyma, by Grattan,<sup>46</sup> wedge-shaped excisions were done after dissecting down an inverted U-shaped flap. The interesting feature in Grattan's case, however, was the use of 50 per cent. trichloroacetic acid, applied periodically, until the higher prominences of the skin were levelled. This treatment was repeated until all areas of the nose had been smoothed out, and the result proved most satisfactory. Four applications were made in all. Subsequently, exposures of the roentgen ray at three-week intervals were given with the idea of further improving the condition of the skin and keeping in abeyance any tendency to recurrence of growth in the tissues treated.

**Cancer of the Nostril.** Cheatele has pointed out that when cancer begins in the upper lip, the columella is more invaded than the ala nasi. The septal origin of the orbicularis oris forms an easy pathway by which the disease reaches the columella. For this reason, Curtis<sup>47</sup> advocates a more radical operation than has hitherto been generally advocated for growths of the upper lip and ala nasi.

The upper lip is split in the middle line, *AB*, and the incision *BC* carried through the columella, and then slightly to the right of the tip of the nose to just above the level of the junction of the ala with the cheek and side of the nose. The external incision, *FE*, from the right angle of the mouth directed upward to the same level as the internal incision, was carried through the lip and cheek down to the bone upward and outward in the direction of the external canthus of the eye, so as to include the zygomaticus minor muscle. The upper ends of these two incisions were joined by a third cut, *CDE*, passing outward and slightly upward—through the nose and entire thickness of the cheek to the bone. To prevent displacement of the remaining nostril, a crescentic area, *M*, around the left ala was excised and the left half of the lip completely detached from the nose and jaw, and the adjacent left cheek thoroughly undercut, so that this half of the lip could be brought across to fill in the gap by suturing to the remaining portion of the right half of the cheek. To facilitate the closure of the gap in lip and face, three parallel

<sup>46</sup> Journal of the American Medical Association, 1920, lxxiv, 1450.

<sup>47</sup> Proc. Royal Soc. Med., 1919, xiii, 16.

incisions were made in this portion of the cheek down to the bone, outward and slightly downward from the outer cut edge; the middle one, *GHI*, about  $1\frac{1}{2}$  inches long, commencing at the level of the junction of the ala with the upper lip, running outward and downward to the center of the buccinator muscle, avoiding the line of Stensen's duct and the danger of salivary fistula by first observing the position of the duct orifice inside the mouth; the lowest incision passed outward from the angle of the mouth, and the uppermost from the upper end of the gap. Reflecting these flaps allowed of exposure of any enlarged buccinator



FIG. 14.—Incisions used by Curtis in the removal of growths of the upper lip and ala nasi. (Curtis.)

glands, but none were met with. Of the two flaps thus marked out, the lower one, *HGFK*, was stitched to the freed left half of the upper lip, and the upper, *LEGH*, attached above it, leaving only the gap caused by the removal of the right ala, to be covered by a subsequent plastic operation, experience having proved this to be safer than any attempt to do so at primary operation. The edges of the crescentic gap, *M*, were then sutured, and the upper edge of the left half of the lip attached to the columella, *Nc*. The enlarged right submaxillary salivary and lymphatic glands, and the large deep cervical gland at the bifurcation of the right common carotid artery, with small chain of glands above it, were

then excised, through the curved incision *PQ*, passing down and out from below the symphysis menti to the middle of the anterior border of the right sternomastoid muscle, which was defined by the incision *OR*, extending downward from the level of the angle of the jaw. The region of the supramaxillary glands, exposed by turning up the flap over the lower jaw *PQO*, was explored, but no enlarged lymphatics were discovered. Convalescence was rapid, and the patient remains alive and well with no sign of recurrence.

### THE SALIVARY GLANDS.

**Salivary Fistula.** Last year I quoted Cole's paper on this subject. It will be remembered that his method consists in making a flap, freeing the duct and resecting its terminal portion. It was then led into a pouch of mucous membrane, which had been slit, and anchored to the mucous membrane of the cheek. The slit pouch was anchored to the deep structure of the cheek. Cole condemned the seton operation. Curtis,<sup>48</sup> however, offers a simple method and describes a successful result: The finest of drainage-tubes, threaded with silk at both ends, is attached to the eye of a probe, the fine point of which is insinuated into the mouth of Stensen's duct and brought out on to the cheek, leaving the tube in the duct. The silk threads are tied over the cheek; after four days they are untied, the tube is dragged some way on to the cheek, and about  $\frac{1}{4}$  inch is removed from the outer end. To the outer end of what remains, a fresh thread is attached, and the tube dragged back into place, thread, however, now replacing in the track the removed portion of tube. In the same way, at intervals of four days, the rest of the tube is gradually shortened, until by the time it has been completely removed, leaking from the fistula has almost ceased. If there is recurrence of leaking, the procedure is repeated. In those cases in which the completely divided end of the proximal portion of the duct is directed outward and displaced, a further procedure is recommended. A probe is passed into the proximal part and the finest drainage-tube threaded at both ends with "black ophthalmic D" worm-gut is inserted into Stensen's duct from the mouth, and its outer end dragged on to the cheek in the manner already described. A non-cutting, round, intestinal needle is now threaded on to the suture attached to the outer end of the tube, and, removing the probe left in the proximal end of the duct, the needle is carefully introduced into the duct for about 1 inch, and its point then made to puncture the duct and emerge through the cheek, dragging with it the suture. The tube is thus brought across from the distal to the proximal portion of the duct, and the divided ends are placed in continuity. The suture is fastened by a loop around the ear, and to the loop is attached the other suture fixed to the inner end of the tube and brought out of the mouth. A collodion dressing, repeated daily, seals the fistulous opening and seems decidedly to facilitate healing.

The inner, or oral, end of the tube is dragged down and shortened by about  $\frac{1}{4}$  inch every fourth day, until it has been completely cut away.

<sup>48</sup> Lancet, 1920, i, 1360.



The suture may be allowed to remain for some days longer if leaking persists. This method follows somewhat the principle adopted by surgeons in the treatment of deep urethral strictures. Cole condemned the method of Leriche introduced in 1916 in which the auriculotemporal nerve was cut. I feel, however, that the operation is so simple that it is well worthy a trial before undertaking the more formidable plastic. To the cases on record, and many of which I have given space, particularly in 1919, we note an additional one reported by Weitz.<sup>49</sup> The fistula had persisted for twenty years and after the nerve resection the secretion stopped at once, and the fistula soon healed. Three cases are reported by Oliver.<sup>50</sup> His technic consists in incising in front of the ear and after locating the temporal artery tracing the twig of the auriculotemporal nerve back to its main branch. The dissection is carried backward and inward internal to the neck of the condyle and the nerve avulsed there with forceps.

A modification of Leriche's method is offered by Stropeni.<sup>51</sup> He injected 3 c.c. of alcohol into the third division of the fifth nerve by the technic well known for the treatment of trifacial neuralgia. Half an hour later the salivary secretion was decidedly less, and this diminution continued throughout the next day but again increased. Nine days later he again injected, after which the secretion ceased completely for twenty-four hours but recurred on the next day. On the following day, however, permanent cure was established. He explains the recurrences by stating it was probably due to the nerve filaments which the parotid receives from the facial and sympathetic nerves, and which were not affected by injecting the trigeminal nerve.

Certain animal experiments have been performed by Ferrarini<sup>52</sup> from which he concludes: (1) Section of the secretory nerve causes a diminution in volume of the parotid or submaxillary gland so that after a month or so it is reduced to one-third its normal weight. Such diminution appears to continue subsequently. (2) Simple atrophy occurs in the zone contiguous to the gland. Epithelial necrobiosis is rare. (3) Edema and an increase in thickness of the interstitial connective tissue occurs, but there is no true sclerotization of the glandular parenchyma. (4) The lesion is transitory and attains its maximum about a month or a month and a half after the operation. Ferrarini, however, is not entirely enthusiastic as evident by the fact that he infers that some of Moreston's cases probably got well anyhow. He does not think there is any single method applicable to all cases, but the choice of operation must be based on the requirements of the particular cases.

## THE JAWS.

**Ankylosis of the Jaw.** The numerous operations which have been devised for this condition may be grouped into: (1) Resection of the neck of the condyle, with or without removal of the condyle. (2) Wedge section of the horizontal ramus of the mandible.

Operations in the first group fail to give relief when the cause of fixation

<sup>49</sup> Deutsche Ztschr. f. Chir., 1919, cxlix, 419.

<sup>50</sup> Lyon Chir., 1919, xvi, p. 204.

<sup>52</sup> Arch. ital. di Chir., 1920, ii, 207.

<sup>51</sup> Rif. Med., 1920, xxxvi, 405.

is situated wholly or in part anterior to the condyle. Those in the second group, in bilateral cases, leave the jaw so weak as to be practically useless for mastication

Chubb<sup>53</sup> reports 5 cases, of which 4 were traumatic in origin, with fracture of the zygoma, with or without direct involvement of the coronoid, but without involvement of the temporomandibular joint. The coronoid was fixed to the lower part of the pterygoid aspect of the maxilla by fibrous or bony adhesions. The operation was the same for each, and was devised to allow of the complete resection of the coronoid process down to its base, without unduly interfering with the muscles of mastication, and without risk of injury to the branches of the facial nerve. The operation was found to give an admirable approach to the pterygoid fossa, and to permit of the resection of the condylar region also, when this was necessary. The scar is almost entirely in the hair region, and therefore practically invisible. In none of the cases was there any involvement of the facial nerve. And in every case there was free and painless mastication of surprising efficiency within a few weeks of the operation.

The incision differs considerably from those hitherto described for operations in this region, and has the three following advantages: It avoids all branches of the facial nerve; it is confined almost entirely to the hair region; and it gives a free and wide approach to the pterygoid fossa. It starts in the pre-auricular fold of the lowest level of the external meatus, and passes vertically upward to about the level of the top of the pinna, from which point it curves gently forward a little below the superior temporal crest, terminating well within the hair area of the temporal region. The incision is carried directly down to bone. The skin, temporal fascia, and temporal muscle are separately defined and turned forward. The deeper of the two layers into which the temporal fascia splits as it approaches the zygoma is divided from its deep aspect, and the more superficial layer—still working from its deep surface—is separated from the outer surface of the zygoma with the respiratory. The zygoma is resected piecemeal with the gouge forceps from immediately in front of the eminentia articularis posteriorly to as far forward as to include a portion of the malar bone anteriorly. For this resection and for the remainder of the operation, the surgeon stands at the head of the patient and approaches the zygomatic fossa from above, that is, by way of the temporal fossa.

The tip of the coronoid can now be readily felt. Its upper and posterior portion is defined by severing the more posterior fibers of the temporal muscle close to the bone, upward traction of the muscle being performed at the same time. The coronoid is now cleared of its muscular attachments with the respiratory and is then resected piecemeal with gouge forceps (Fig. 15) guided by the finger, until the anterior border of the ascending ramus passes in a smooth curve down to the commencement of the alveolar border of the horizontal ramus.

In this resection the surgeon is working between the deeper fibers of the insertion of the temporal muscle and the belly of the external pterygoid

<sup>53</sup> Proc. Royal Soc. Med., 1919, xiii, 21.

on the one hand, and the under surface of the masseter muscle as this passes to its insertion into the outer face of the coronoid and angle on the other. Anteriorly and inferiorly, ordinary care is sufficient to avoid injury to the mucous membrane covering the lowest portion of the coronoid, and separating the latter from the oral cavity.

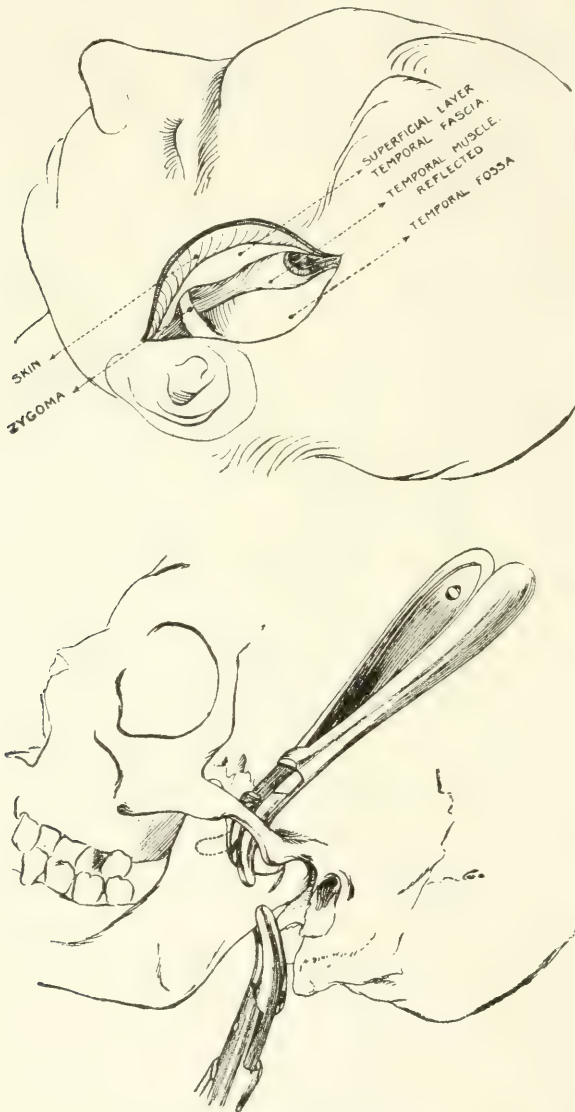


FIG. 15.—Chubb's technic. Ankylosis of jaw. (Chubb.)

In actual practice, the difficulty experienced in the removal of the coronoid varies enormously according to the nature and extent of the injury, and the degree of ankylosis to the surrounding bones.



In cases in which only the coronoid is to be removed, the operation is completed by stitching back the temporal fascia and muscle into place and closing the skin incision, a small drainage tube being left in the wound for forty-eight hours. In the fifth case it was necessary to resect the neck of the condyle also. This was done, partly through the temporal incision already described, the neck being attacked on its anterior aspect with curved gouge forceps. On account, however, of the large and very hard mass of bone occupying the site of the joint in this case, and in order to minimize the risk of injury to the internal maxillary artery, the resection was completed from behind, the lower border of the angle being defined by means of a horizontal incision below this region (Fig. 16)

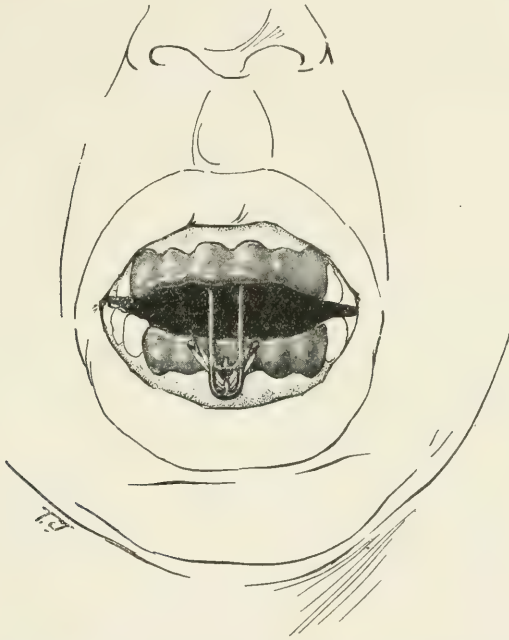


FIG. 16.—Metal splints with rubber band for maintaining constant traction on mandible.

and the condylar neck reached by a subperiosteal resection of the posterior border of the ascending ramus (Fig. 16). This second incision was also useful for the “Murphyzation” of the future pseudoarthrosis by means of a flap of the posterior portion of the temporal fascia and muscle, which was turned down, brought through the gap made by the resection of the condylar neck and secured in the deeper layers of the wound.

An unusual case of ankylosis of the jaw following recurrent rheumatism of childhood is reported by Phemister.<sup>54</sup> The most noteworthy feature of his report is the ingenious method of keeping the jaws open after operation by means of a spreader appliance. He credits this to F. B. Noyes. It consists of cast metal splints cemented on to the upper

<sup>54</sup> *Surgery of Clinics*, Chicago, 1920, iv, 845.

and lower teeth and connected by a bridge about 1 inch long which was hooked into the upper splint and connected to the lower by means of a rubber band passing from two hooks on the lower splint over the hook on the lower end of the bridge, thereby exerting continuous traction, which brought about separation of the jaws. Spreading by this means was kept up all night and during most of the day for the first month. When it was not in action the patient was encouraged to use the jaw as much as possible, especially by chewing gum. Later on, the splint was applied only at night (Fig. 16).

**Gunshot Fractures of the Mandible.** Our knowledge of this injury has has been considerably enriched by the experiences of the War. A short, but very comprehensive paper is offered by Ivy<sup>55</sup> who has had exceptional experience, not only as an operator, but also by reason of his connection with this work in the Surgeon-General's office. Of approximately 600 patients requiring hospital treatment after return to the United States, 445 involved the mandible and 155 the maxilla. In 36 cases both upper and lower jaws were involved.

Of 445 cases of gunshot fracture of the mandible retained in U. S. Army hospitals for treatment, 322, or 89 per cent., of the American Expeditionary Forces total secured bony reunion without the bone graft, leaving 123, or 11 per cent., of the total resulting in non-union or vicious union, and requiring bone graft. In 2 of these cases of non-union the patients refused operation.

Up to the present date, 103 bone grafts have been made or have come under observation at the army hospitals. Cases of vicious union with such loss of substance as to require bone grafting were comparatively few, probably not more than twelve in all. This was because most of the cases received early and constant attention in the form of reduction and fixation with respect to proper occlusal relationship of the upper and lower teeth. In other words, collapse of the fragments to close the space due to loss of substance was not permitted, a non-union with good occlusion being regarded as a lesser and more easily corrected evil than firm union in bad position. The almost universal preservation of good occlusal relationship in these cases, and the exceptionally large percentage of good functional results in cases without bone grafting are principally due to the efficient and painstaking work of the dental officers.

Various methods were used as shown in the following table, and it would seem as though the pedicled graft offered the greatest possibilities of success.

TYPES OF GRAFT AND RESULTS.

Types of graft.	Successful.	Partially successful.	Failures.	Doubtful.	Total
1. Pedicled graft from mandible . . .	27 ( 87%)	3	1	..	31
2. Osteoperiosteal from tibia . . .	27 ( 71%)	3	8	..	38
3. Crest of ilium . .	5 ( 71%)	1	1	..	7
4. Cortex of tibia . .	11 ( 65%)	1	2	3	17
5. Rib . . .	6 (100%)	..	..	..	6
6. Ramus sliding . .	2	..	1	..	3
7. Ox-bone . . .	..	..	1	..	1
Total . . .	78 ( 76%)	8 (7.7%)	15 (13.5%)	3	103

<sup>55</sup> Journal of the American Medical Association, 1920, lxxv, 1316.

Another excellent article is contributed by Chubb,<sup>56</sup> who describes the results of 60 cases. He used an autogenous graft from the ilium in all but 2 cases. He believes that this source has several advantages. The size of the graft is practically unlimited. All sclerosed and doubtful bone can, therefore, be freely removed from the jaw fragments. The soft and vascular nature of the iliac crest greatly facilitates the manipulation of the graft and its subsequent union and consolidation. Furthermore, it is possible, by varying the position on the crest, to obtain a graft of a general curvature suitable to each particular case. There is a complete absence of postoperative disability, even when the anterior superior spine has been removed with the graft. The cases were, as a rule, up and about fourteen days after the operation, and in no instance has there been any complaint of the hip.

The technic of this operation is described very fully by Chubb but would require too much space to reproduce. It should be consulted in the original. Ivy<sup>57</sup> gives the following very brief description, "After first thoroughly exposing the ends of the fragments they are trimmed off and freshened, and a hole is drilled in each through which a silver wire is passed. An incision is now made along the crest of the ilium, beginning at the anterior superior spine, the muscles attached to its inner and outer surfaces are stripped down, and a piece of bone of sufficient length and depth removed to fill the gap in the mandible. A hole is drilled in each end for passage of the silver wires for connection to the mandible. The detached muscles are brought over the site of removal of the graft, sutured together with catgut, and the ilium wound closed.

The permanent character of the repair after bone grafting must await the test of time, and Chubb remarks that a number of factors must be taken into account. The prolonged disuse results in a weakness of the muscles of mastication and the same cause greatly increases the normal periodontal sensitiveness. That these, however, are not permanent conditions is shown by the nature of the diet of some of the patients within a few months of the operation. By the method adopted for obtaining the graft, the upper or alveolar border is constituted by open cancellous tissue. Successive radiographs show that under the influence of the stress and strain to which the graft is subjected in the normal use of the jaw, the architectural structure becomes modified in accordance with Wolff's law, and a compact layer of bone is formed, completely encircling the central tissues of the graft. In several cases he found the graft able to bear directly the pressure of a denture within a few months of the operation.

On the whole, it is probable that the free graft remains alive and takes an active osteogenetic share in the union. The graft, with its thin tables of compact bone, is relatively more transparent in the earlier postoperative radiographs than is the far denser mandible. There is, however, no constant postoperative increase in this relative transparency. On the contrary, successive radiographs show a uniform increase in the opacity of the graft.

<sup>56</sup> *Lancet*, 1920, ii, 9.

<sup>57</sup> *Annals of Surgery*, 1920, lxxi, 363.



The favorable influence of early exposure to stress is strikingly shown by 7 cases. The splints in each case were removed in the second or third week, and in one case within three days of the operation a flange being fitted to prevent lateral strain upon the graft. Four of these cases were firmly united within the month, and the remaining 3 were firm before the end of the third month. In 2 cases in which union was secured within the first month, a previous bone graft (not by the author) had been attempted and failed. In one of these the loss involved the greater part of the ascending ramus. In only 1 case did the posterior fragment bear teeth, one molar tooth being present on each fragment. The splints in this case were, however, loose from the time of the operation onward. In 1 case no teeth were present on either fragment, and there were only two teeth in the upper jaw.

**Tumors of the Antrum and Accessory Nasal Sinuses.** The operation of excision of the upper jaw, fearful to look upon, is comparatively easy to perform, and, if preceded by ligation of the external carotid artery, has always seemed to me to be productive of but slight mortality and reasonably good cosmetic results. The question of cure is entirely different and I have felt quite hopeless about the outcome when the malignant growth has invaded the accessory sinus. The paper by New<sup>58</sup> particularly concerns the first point. He states that the mortality from European clinics is from 12 to 30 per cent., and that, according to Schley,<sup>59</sup> the average operative mortality of resection of the upper jaw in recent years in America has been from 12 to 13 per cent., that this has been accomplished by almost complete control of sepsis and hemorrhage, and that pneumonia should be no more frequent after this operation than after the average operation.

In order to eliminate the operative mortality and improve the end-results, New advises the use of the cautery and radium. During the two and one-half years from January 1, 1917 to July 1, 1919, 18 cases were so treated, 15 others being rejected because they were too far advanced. His technic is as follows: The patient is anesthetized with ether by the drop method. The mask is removed after he is asleep. The head of the table is lowered to prevent any secretion in the pharynx from draining into the trachea. A mouth gag is inserted on the side opposite the growth and a water-cooled retractor is inserted on the diseased side; a curved retractor holds the tongue out of the way. This gives good exposure and prevents burning the lips or cheeks when the cautery is used. If the growth has not bulged the cheek or palate, the opening into the antrum is made above the alveolar process, as in the Denker operation. If both the cheek and the palate are involved, a large area of the palate and the jaw is removed with the cautery. The soldering iron is used as a cautery at a dull heat; a red iron carbonized, and presents the penetration of heat. The electric cautery has such a large heating element in the handle that it prevents a good view of the cautery point. The soldering iron is carried up gradually into the antrum and the entire growth is thoroughly cooked for from thirty to forty-five

<sup>58</sup> Journal of the American Medical Association, 1920, xxiv, 1296.

<sup>59</sup> Annals of Surgery, 1919, lxi, 8.

minutes. The limits of the growth are known from the clinical examination, and the cautery is used at the location of the antrum cavity at which it is most needed. Since there is practically no bleeding with this treatment, the walls of the antrum may be inspected to determine whether or not the growth has been thoroughly removed. As the patient begins to wake up from the anesthetic, the irons are removed, and the mask is applied to the face, and the patient again put to sleep with ether. This may have to be repeated two or three times before the cauterization is completed.

Sometimes at the time of operation, or sometimes from ten days to two weeks later, 100 to 200 mg. radium are introduced for from twelve to twenty-four hours inside the antrum and radium treatment given outside the cheek. The radium treatment may be repeated in three weeks, if indicated.

There was no mortality in his series and 10 of the 18 patients can be considered without recurrences for a period of months or years. When we turn to the second proposition, namely, that extension into or involvement of the accessory nasal sinuses is well nigh hopeless, the enthusiastic paper by Barnes<sup>60</sup> is well worth attention. He makes the optimistic statement that "with the combination of operation and radiation it is hard to say just where the limit of the operative case should be drawn." He reports 8 cases, 7 of which were of the hopeless type, of long standing and involving both the ethmoid and sphenoid. There was one operative death and four of the others are without recurrence. Insofar as I can make out from his description, he proceeds about as follows. A V-shaped incision (Moore) is made in the cheek, the upper line of which should not be placed too near the rim of the orbit for fear of subsequent edema of the lower lid. He then removes the front wall of the antrum and proceeds to attack the disease here and up into the accessory sinuses with curette and rongeur forceps until all macroscopic evidence of malignant tissue is removed. Wherever possible, it is desirable to remove a small margin of normal tissue. In the sphenoid and ethmoid this is impossible, nor is it desirable in the antrum except in the alveolus and the palate, where it may be accomplished without danger to other important structures. The same is true of the nasal septum. If the orbital tissues are apparently not invaded, the eye may be left, postoperative radiation of the parts being depended upon to check any further extension in this direction. If there is any question of the involvement of the orbit, an exenteration should undoubtedly be done. After all the tumor tissue has been removed, the V-shaped flap alluded to above is cut from the cheek and the cavity lightly packed with gauze, in the center of which a radium tube of appropriate strength is placed. This tube remains in place about two weeks, being reinserted with each dressing during that period. As the tube loses one-sixth of its radiating strength every twenty-four hours, it is to all intents and purposes inert at the end of convalescence. Three or four subsequent radium treatments are given at weekly intervals. This has been done even when all of the gross

<sup>60</sup> Boston Medical and Surgical Journal, 1920, clxxxiii, 648.

tumor tissue was successfully removed and when no signs of recurrence were present.

It will be noted that the wide opening in the face remains permanently open. This is done for purposes of observation, and the defect, in at least 1 case, covered by an "esthetic plate."

A little note by Moschcowitz<sup>61</sup> is tucked away in the Transactions of the New York Surgical Society. He reports a case of sarcoma of the ethmoid pushing the eyeball forward and outward which was "cured" three and one-half years after operation. He made an incision extending from the middle of the eyebrow and over the nose, a little to the left of the center. In order to gain good exposure and access to the tumor, he now made an incision through the periosteum from the root of the nose outward and downward, and a similar incision at the junction of the nasal bone and the cartilage. The underlying bone was sawed through and fractured in such a fashion that it hung externally upon a periosteal pedicle. The nose was then opened and the structures of the orbit, including the pulley of the superior oblique, were peeled back. The eyeball was protected by a spoon-shaped instrument. This procedure exposed the tumor, about the size of the end of a finger, attached by a broad pedicle to the os planum of the ethmoid. It was removed with ronguer and chisel.

### THE LIPS, TONGUE AND MOUTH.

**Macrocheilia.** Last year we had the paper by Moorhead and Dewey upon this rather unusual affection, and they limited their discussion to the various forms of lymphangioma. Hatton<sup>62</sup> recalls that the term has been used not only to include the better-known lymphangioma, but also certain unrelated mucous gland enlargements. Cases of "double lip," hyperplastic or hypertrophic mucous glands, polyadenomas, etc., are included under this heading. The enlarged soft lip is covered by smooth mucous membrane, with palpable nodules beneath it. The fold formed by the projecting red portion is more conspicuous when the person is laughing or talking. In the upper lip the fold is divided by the frenum, and the lower is always single.

Hatton discusses 19 cases reported in the literature and concludes that it is difficult, if not impossible, to classify these conditions on the basis of any terminology, and it would therefore seem wise to abandon such descriptive terms as macrocheilia and double lip for the more exact names associated with the actual pathologic condition that does exist.

**Cancer of the Lip.** A very valuable statistical paper appears from the Mayo clinic written by Broders<sup>63</sup> who reports 537 cases, representing 26.85 per cent. of 2000 cases of general epithelioma. Only 11 females were in the group (1 to 49). The average age was 57.3 years and the youngest patient twenty-one years old.

The incidence in relation to tobacco-using was most interesting. Of

<sup>61</sup> Annals of Surgery, 1920, lxxii, 390.

<sup>62</sup> Journal of the American Medical Association, 1920, lxxv, 1176.

<sup>63</sup> Ibid., lxxiv, 656.



537 patients with cancer, 78.6 per cent. used tobacco, but of 500 men without epithelioma of the lip 80.49 per cent. were users; the average age of the normal cases was nineteen years less than the afflicted patients. Tobacco using *per se*, therefore, is not an important factor but the remarkable fact was elicited that the total number of pipe smokers in the cancer group was 78.48 per cent. and cigarette smokers 1.16 per cent., whereas in the normal group the total number of pipe smokers dropped to 38.03 per cent. and the cigarette smokers rose to 59.04 per cent.

The paper contains a large number of tables and 39 conclusions deduced therefrom. From these I have selected the following:

Of the patients operated on and traced, 40.52 per cent. are dead and 59.47 per cent. are alive.

Of the living patients, 92.85 per cent. report a good result, having been free from the disease on an average of 7.76 years.

Of the patients operated upon who have died, concerning whom information has been received, 63.63 per cent. died from epithelioma.

Eight, or 1.55 per cent., of the patients who were operated on died in the clinic, while the actual operative mortality was only 0.77 per cent.

The patients who were treated with pastes, plasters, etc., before entering the clinic did not get such good total results as those who were not so treated; 62.06 per cent. in the former and 77.08 per cent. in the latter; moreover, 31.91 per cent. of the former who were operated on had metastasis, while only 19.48 per cent. of the latter operated on had metastasis.

Of the patients with metastasis, 17.39 per cent. are living and 82.6 per cent. are dead

Of the living who had metastasis, 83.33 per cent. report a good result. In these patients the submaxillary lymph nodes on only one side were involved.

No patient with the cervical nodes or more than one group of any lymph nodes involved has been reported living. A clinical study of 107 cases, treated with the roentgen ray or radium, singly or combined is noted in the report by Lain.<sup>64</sup> He does not mention his technic, and says that "neither surgery, radiotherapy nor any other one successful method of treatment should be used in all cases alike." Of his 107 cases, I judge from his table that approximately 85 per cent. were considered cured. His best results were obtained in those epitheliomas which begin as a seborrheic-like crust, a small recurrent vesicle or fissure, at first superficial, later becoming infiltrated and indurated, etc., and situated entirely or almost entirely on the cutaneous surface of the lower lip. The worst results, he believes, will be encountered where more than one-half the malignant growth is situated on the mucous surface of the lip and of many weeks' or months' duration.

Some nice illustrations accompany an article by Cole<sup>65</sup> and he lays stress on the difference between the nutrition of the tissues in the young adult as compared with the old. For this reason the second method, pictorially demonstrated is unsuitable for the more elderly patients.

<sup>64</sup> Journal of the American Medical Association, 1920, lxxv, 1052.

<sup>65</sup> Lancet, 1920, ii, 845.

Both methods, however, are alike in that the angle of the mouth is formed, and it should be, by rotation and not by the junction of mucous membrane to skin along a linear slit. He objects to the cosmetic and functional results obtained by Dowd's method, particularly in that lip control is defective and dribbling constantly occurs (Fig. 17).

**Cancer of the Larynx.** Total laryngectomy is one of the most severe operations which the surgeon is called upon to perform, and, as a rule, the results are not very good. Furthermore, it is usually held that such patients, if they remain well, are reduced to dumbness and sign language. Symonds<sup>66</sup> offers an excellent report of the end-results of operation on four patients eight, twelve, fifteen and a half and twenty-two years, respectively, later. The disease was very extensive in all the cases and Symonds promises a description of the technic in a later communication. He states that the avoidance of preliminary tracheotomy facilitates the

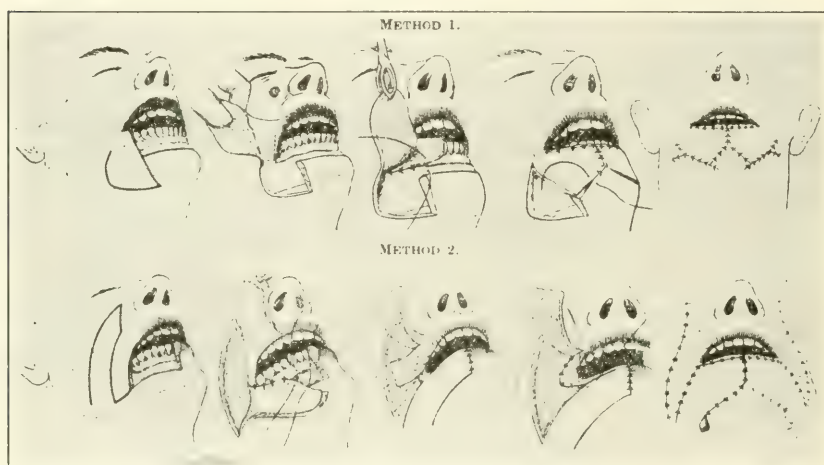


FIG. 17.—Plastic flap methods advocated by Cole.

operation and diminishes infection. The important point of his communication is that these patients can be understood by these around them by simple lip-movements and the vibration of such an amount of air as can be taken into the mouth and pharynx, while with the tube the patient can be heard in a large room.

The speaking tube was simple in construction, the attempt to introduce a sound reed not being successful. It is described as follows: The tracheal tube is of large size, slightly conical and fits the trachea closely; it has no inner tube. It is inserted as soon as the trachea is brought forward at the operation. Fitting into this is the special apparatus for speaking, which has a flap-valve admitting air on inspiration. This valve closes on expiration, the air passing through a tube attached to the upper surface and thence into a rubber tube, by which the stream of air is carried to the lips. A vulcanite piece fits into the distal end of the

<sup>66</sup> Lancet, 1920, i, 652.

rubber tube, the end of which is flattened and the orifice narrowed so as to deliver a broad and forcible stream of air. The exit tube, to which the rubber is attached, should have as wide a diameter as possible, and should be a good inch from the shield so as to carry the rubber clear of the skin.

**The Use of Radium.** The literature begins to teem with reports and papers on radium therapy. Those interested should consult the reports of the London Radium Institute, the special journals on radium and the report by Janeway of the work done at the Memorial Hospital in New York City. It is hardly possible in these columns to cover the field properly and I do not feel entirely competent to do so. The epidermoid cancers of the mucous membranes of the nose, mouth, and larynx are excessively malignant if we judge by the published reports of series of cases. Operative treatment is not satisfactory because it is so often impossible to work around the malignant growth through healthy tissue. The  $x$ -rays are unavailing except to check the peripheral spread through the neck. For those reasons the increasing use of radium is welcomed and I look forward to the time when we can look forward to better results than we have so far been forced to accept.

The report of the London Radium Institute by Binch<sup>67</sup> for the year 1919 contains the following statements: Cases of carcinoma of the tongue, palate, and buccal mucous membranes only come under treatment when surgical all measures have been exhausted and recurrence is widespread, producing constant and severe pain. The results of treatment in such cases are unsatisfactory. Upon those in which acute ulceration predominates, radium has very little effect, although occasionally exposures of one to two hours' duration to tube apparatus in contact with the ulcerated surface on four or five successive days tends to arrest the ulceration and sometimes to induce very transient repair. Cases in which induration predominates are more amenable; when the induration is circumscribed, or in the form of small non-ulcerated nodules in the tongue, the floor of the mouth, the palate or jaws, the insertion of a small powerful emanation tube, screened with 0.3 mm. of platinum, for five to six hours, will bring about their disappearance. The probability of lymphatic infection may be diminished by the prophylactic radiation of the cervical and submental glands. Exuberant papillated epitheliomatous growths of the mucous membrane of the mouth, with little submucous invasion, if treated at an early stage by burying powerful emanation tubes, often clear up completely and then seldom recur. With old lymphatic infection and masses of indurated glands prolonged exposures, with heavily screened apparatus, are often of considerable use in diminishing the size of the glands and preventing implication of the skin covering them. In some cases the neuralgic pains are distinctly relieved after prolonged irradiation, but this result cannot be assured in any particular cases.

Pinch describes the apparatus, screens, etc., used in the Institute. They are both the radium salt and radium emanations. Radium eman-

<sup>67</sup> British Medical Journal, 1920, i, 640.



ations are becoming more popular. Janeway<sup>68</sup> describes the advantages of buried radium emanation in the treatment of cancer of the tongue and tonsil. The objection to local applications on the cancer surface is the difficulty of obtaining complete and uniform penetration unless heavy filtration is resorted to. He has used the new method continuously during the past year at the Memorial Hospital. The minute glass tubes containing the emanation are placed in the distal end of a needle no larger than a slender aspirating needle. The aspirating needle is then inserted within the tumor tissue and the tube is expelled by a wire stylet. Janeway summarizes:

1. There is very little loss of the radiations, inasmuch as the emanation is inserted within the tumor tissue and left there either permanently or until it sloughs out. Almost 100 per cent. of its efficiency is directed against the tumor.

2. It is a most economical way of using radium, as small quantities will produce changes accomplished by other methods only with the use of large quantities.

3. Instead of wasting the more weakly penetrating gamma rays and the beta rays by filtration, the tumor tissue itself is made to act as a filter, and those rays, which are filtered out by other methods, particularly the beta radiations ten times as numerous as the gamma rays, are made use of to destroy the growth.

4. A more intense radiation of the growth can be secured with greater safety and with less discomfort to the patient, because these softer gamma radiations and the far more numerous beta radiations possess a limited range of penetration around each tube as a center, and, in consequence, heavy dosage can be given to the tumor tissue alone with little damage to the surrounding tissues.

5. The simplicity of the method makes it not only the easiest method of exposing tumors to radium but furnishes a way of thoroughly radiating tumors which are inaccessible to any other method of treatment; for instance, tumors of the tonsil, the pyriform sinus, or even the rectum.

It will be noted that Barnes, whose paper I have reviewed, also uses radium emanation. As most of us are not radium experts I feel that the following brief, but adequate, description by Barnes is quite illuminating: Radium emanation is a gaseous product that is given off from the element itself and collected in small glass tubes about half a millimeter in diameter. These tubes give off the same kind of rays as radium. These are of three kinds: the Alpha, the Beta, and the Gamma. The alpha and beta rays are extremely burning in character, but have only slight penetrating powers, particularly the former, which are stopped by a single sheet of paper. They constitute respectively 10 and 89 per cent. of all the rays that pass through the glass of the tube. The gamma rays have little burning action, but have great penetrating power. They constitute 1 per cent. only of all the rays. The tubes are of carefully measured radiating strength and may be used directly on the patient and discarded when their radiation becomes too feeble to be of any

<sup>68</sup> American Journal of Roentgenology, 1920, 7.

further value. If a burning destructive action is desired, the tubes may be used without covering of any sort and either held near the part or inserted directly into the tissue by means of a cannula. When a milder action is wanted, the rays must be screened, that is, certain of the burning rays must be sifted out, and for this purpose either the tube is held a longer distance from the part, by means of gauze, or covered with a steel jacket. Usually both these methods are employed. The severity of the reaction then may be controlled by the radiating strength of the tube, by the time of exposure and the amount and character of the screening. Parts that are not intended to be radiated at all but are in the immediate vicinity of the neoplasm are protected by means of sheets of lead of varying thickness according to circumstances. The unit of radiation is the millicurie, which is equal to the radiation from 1 mg. of radium.

**THE REACTION OF RADIUM.** Even if physicians or surgeons do not use radium, they are often confronted with the necessity of caring for the patient suffering from excessive reactions. Pinch goes into this subject carefully in his report. Mucous surfaces are much more responsive than dry skin, and moist skin or surfaces more than dry. Carcinomatous or sarcomatous tissue does not show the same resistance to radium rays as normal cells, and it is upon the appreciation of this fact that successful radium therapy largely depends. Tissues which have previously been treated much with  $x$ -rays or ionization, or by carbon dioxide snow, or cauterization, require special care, as slight overdosage may be followed by breaking down of old scar tissue far beyond the area it is desired to affect. The reaction is influenced not only by the strength of the applicator but by the size of the area to which it is applied. Further, marked personal idiosyncrasies are observed; in neurotic persons both the local and systematic reactions are likely to be greater than in the phlegmatic. In the treatment of some uterine conditions, it is desirable to use only half strength in persons of neurotic temperament.

Four degrees of local reaction are distinguished:

1. Simple erythema.
2. Erythema followed by desquamation.
3. Vesication with superficial ulceration.
4. Deep ulceration, generally followed by the formation of a definite "limpet-shell" crust, beneath which repair takes place.

Certain late effects must be guarded against: among them are pigmentation and telangiectasis, noticed especially after treatment of cutaneous nevi; the risk cannot be altogether avoided, but it may be diminished by taking care to avoid vesication. Patients should be seen after three months for at least two years, and any telangiectasis destroyed with a fine electric cautery. Pigmentation may be kept in check by the application of a weak lotion of mercury bichloride and glycerin. Superficial ulceration sometimes follows prolonged treatment of nevoid growths; the treatment must then be suspended for at least six months, and resumed with care.

## CERVICAL RIBS.

No mention has been made in these columns of the interesting anomaly since 1915. Since then a number of scattered case reports have appeared until this year when several articles have brought the subject forward for discussion. A comprehensive collective review by McWhorter<sup>69</sup> contains much information, an analysis of the literature and an excellent bibliography. Todd states that a rib articulating with the seventh vertebra or a rudimentary first rib occurs in about 1 per cent. of cases, but McWhorter, in 100 cadavers, found them more frequently. Borchardt has stated that only 5 or 10 per cent. of cervical ribs are associated with, or the cause of, symptoms, but if such is so, a percentage of 1 in 2000 persons suffering from symptoms due to this anomaly represents a fairly large portion of the population. Radiographers encounter in patients of all ages rudimentary ribs not only of the seventh cervical but also of the first dorsal which have never produced any clinical symptoms.

Honeij<sup>70</sup> reports 21 cases of cervical ribs, complete and rudimentary, and also tabulates an excellent bibliography. This paper gives a summary of the views of Todd, Tredgold and Capitan regarding the etiology of the anomaly. McWhorter omitted Capitan from his list, but the latter's paper published in 1915 on the ontogenic and philogenic signs of supplementary cervical ribs is quite interesting. Capitan points out that birds, like ostriches, have cervical ribs and that the dolphin and porpoise have developed cervical ribs with projections articulating with the first thoracic rib. It is interesting to note, therefore, that in man the embryo has 29 pairs of rudimentary ribs and that consequently 17 pairs disappear before birth. All cervical vertebrae naturally then have rudimentary ribs and it is the seventh cervical rib which is the last to disappear in fetal life. If we start to reason from this point, we are face to face with the fact that here something happens to prevent the retrogressive changes from taking place. Todd believes that it is an interference in absorption but also that the disappearance of the seventh cervical rib may be due to pressure of nerves and consequently atrophy of the compressed tissue. Todd also states that the vessels have equal importance with the nerves as causative factors in those modifications of the upper end of the thorax which are represented by the pressure of rudimentary ribs. This, however, would not account for the disappearance of the fifth and sixth cervical ribs. We know, of course, that the rudimentary rib is grooved for artery and nerve, and, as Todd points out, this is most marked in fetus and in cervical ribs, least apparent in the adult and in an intermediate condition in the child. Dwight suggested that the principle underlying these variations is the movement of the whole thorax upward or downward on the vertebral column.

Capitan reiterates that it is merely a progressive evolution, pointing out that the thorax is reduced at its two extremities.

The symptoms are mostly grouped into nerve and bloodvessel disturbances and are described in detail by Honeij. As he well says, the

<sup>69</sup> Surgery, Gynecology and Obstetrics, 1920.

<sup>70</sup> *Ibid.*, xxx, 481.



variety and combination of symptoms are difficult to tabulate. The interesting and not uncommon point is brought out that after operation severe scar-tissue formation has often resulted, which has given rise to all the previous symptoms of cervical ribs and, in some cases, these symptoms were more severe after operation than before. Honeij also calls attention to the importance of trauma. Muscular effort, bony compression, inflammation, and, in elderly individuals, change in posture, with forward or lateral bending of the vertebral column associated with tissue changes, may all give rise to symptoms with either cervical ribs or enlarged transverse processes present.

McWhorter has noted the studies of Leriche and Stopford and Burrows upon the production of trophic changes after gunshot injuries when there is only an arterial lesion, the trophic disturbance being due to the associated injury to the perivascular sympathetic nerve. The work of Leriche and the operation of vascular sympathectomy suggested by him for the relief of causalgia, etc., is well known, and the papers of Stopford and Burrows are also very suggestive. It is the first time I have noted anyone associating these observations with the symptomatology of cervical rib. Stopford<sup>71</sup> reports 10 cases of compression of the lower trunk of the brachial plexus by a first dorsal rib. He states that the symptoms are precisely those of cervical rib and remarks that "in all the 10 cases except 1 (and that was a very early one) objective sensory disturbances were present, and it is of diagnostic value to mention that in all the 9, loss of protopathic sensibility were greater than the epicritic loss—a dissociation suggested as characteristic of nerve compression. Trophic and vasomotor phenomena are very constant, the most frequent being hypothermia, pallor or cyanosis, and trophic sores affecting the little and ring fingers and more rarely the inner border of the forearm. There does not appear to be any advantage in subdividing the cases into the three types—motor, sensory and sympathetic—according to which group of symptoms predominates, provided it is remembered that weakness of the hand, objective and subjective sensory manifestations, and trophic disturbances in the hand and forearm may be the result of compression of the lower trunk by a first thoracic rib as well as by a supernumerary costal element."

In addition to the 21 cases of complete or rudimentary cervical rib, Honeij reports 17 others in which the presence of cervical ribs was suspected, as they presented more or less typical symptoms and histories. Roentgen examination, however, did not reveal such a condition as existing. I would suggest that a possible explanation for such cases is offered by Davis<sup>72</sup> in the *Surgical Clinics*. He states that "Dr. Joseph Miller has called attention to the fact that in some cases there is a definite picture of cervical rib disturbances, but no rib is seen in the *x*-ray picture. He has suggested that if these symptoms persist for a year or longer, and do not respond to general treatment, it is advisable to do an exploratory operation. At times a short rib is found, the shadow of which has been superimposed upon the shadow of the transverse process of the

<sup>71</sup> *British Journal of Surgery*, 1919, vii, 168.

<sup>72</sup> *Surgical Clinics*, Chicago, 1920, iv, 269.

seventh cervical vertebra. At times, a tendinous band may extend from a short rib or from the seventh transverse process to the first thoracic rib. Within this tendinous band islands of cartilage may be found suggestive of an undeveloped anlage of a cervical rib. The brachial plexus may be stretched over this tendinous band in such a manner as to give symptoms. Acting on this suggestion, complete relief was obtained in a patient who showed unilateral symptoms but no cervical rib on *x-ray* examination. The patient went through a very painful convalescence of two months' duration. A year later symptoms developed on the opposite side. Because of the unpleasant convalescence, the patient endured the discomfort for one year before reporting for operation. Again no rib could be found by *x-ray* examination. A number of connective-tissue bands suggestive of strong fascia were removed, and the patient obtained complete relief." This case just quoted brings up for consideration the paper by Law<sup>73</sup> in which 4 cases similar to that of Davis are mentioned. "The ligaments were all tightly stretched, and while they all had their origin from the tip of the seventh cervical transverse process, they varied markedly in their point of insertion, for one was inserted with the scalenus anticus muscle into the scalene tubercle of the first rib, another into the costoclavicular ligament, the next into the sternoclavicular ligament, while the last was inserted well toward the midline into the interclavicular ligament close to the head of the clavicle."

Law has some good illustrations and states that the nearest description of anything resembling the complete ligaments is described by Zuckerkandel, who, in his dissections, discovered that there were certain inconstant and extremely variable bands which have been associated with Sibson's fascia and which are occasionally found reënforcing and helping that fascia to fix the dome of the pleura.

Whether the adventitious bands are a remnant of supernumerary ribs, are a variation of the Sibson's fascia, or are in themselves a distinct entity, has not been determined.

There is nothing particularly new to offer relative to treatment except that Stopford suggests development of the trapezius by faradic stimulation, exercise and massage in the traumatic cases (he is particularly referring to first dorsal anomalies).

"If definite improvement is not manifested after a course of three or four weeks' treatment, it seems unwise to persevere further without considering very seriously the advisability of surgical interference, since continuation of the compression and irritation by the rib is likely to lead to intraneural changes, which may prevent the occurrence of complete recovery even after excision of the rib at a later date."

He also suggests that electricity, exercise and massage and treatment of the forearm and hand muscles, would be a beneficial routine after-treatment in all cases where excision of the rib, whether cervical or first dorsal has been resorted to.

Both Law and Telford (in Stopford's paper) prefer the anterior incision

<sup>73</sup> *Annals of Surgery*, 1920, lxxii, 497.

and describe the operation in detail. The incision is made parallel to, and above, the clavicle and curves upward between the sternomastoid and trapezius. The scalenus anticus should be exposed and mobilized and the exact position of the subclavian artery located. The brachial plexus must be handled gently, the suprascapular nerve avoided and the branches of the cervical plexus (circumflex) saved. In order to avoid the danger of injury to vessels and nerves, Rovsing<sup>74</sup> operates through a posterior longitudinal incision parallel to, and 2 cm. from, the spinous processes. The rhomboid and trapezius muscles are cut through, and the splenius pushed to one side. The cervical rib can then be felt and removed, which Rovsing accomplishes by means of a "rib-guillotine." A report of 3 cases not operated on is given by Dubois.<sup>75</sup>

McWhorter gives the following as possible postoperative disturbances: (1) A bony new formation from the stump, especially if subperiosteal resection is done (Jones); (2) injury to the pleura with emphysema or empyema; (3) aneurysm; (4) injury to the plexus at operation causing increased paralysis and muscle wasting; (5) acute neuritis (Lewis).

### THE THYROID GLAND.

**Goiter.** A glance at the columns of the *Index Medicus* or the *Cumulative Index* will reveal a great mass of literature on this subject. From the laboratories, the internists and the surgeons, there is a continuous output of contributions, of greater or less moment, in mass indicating the widespread interest in the many-sided aspects of thyroid disease. As most entertaining, though chiefly of historical value, is the "Operative Story of Goiter," by Halstead. Here is recorded Gross' point of view as to the propriety of removing a goiter. About half a century ago he wrote, "Every step he takes will be environed with difficulty, every stroke of his knife will be followed by a torrent of blood, and lucky will it be for him if his victim live long enough to enable him to finish his horrible butchery. Thus, whether we view this operation in relation to the difficulties which must necessarily attend its resection, or with reference to the severity of the subsequent inflammation, it is equally deserving of rebuke and condemnation. No honest and sensible surgeon, it seems to me, would ever engage in it."

What a transformation there has been from this picture of butchery to the refined technic of the modern thyroidectomy.

One of the most important chapters in preventive medicine is now being unfolded by the work of Marine and Kimball<sup>76</sup> who have studied the value of the prophylactic use of sodium iodide in school children. Of 2190 pupils taking 2 gm. of sodium iodide twice yearly, five have shown enlargement of the thyroid, while of 2305 pupils not taking the prophylactic, 495 have shown enlargement of the thyroid. Of 1182 pupils with thyroid enlargement at the first examination who took the prophylactic, 773 thyroids decreased in size, while of 1048 pupils with

<sup>74</sup> Hospitalstidende, 1919, lxii, 679.

<sup>75</sup> Arch. Méd. Belges, 1919, lxxii, 40.

<sup>76</sup> Archives of Internal Medicine, 1920, xxv, 661.



thyroid enlargement at the first examination who did not take the prophylactic, 145 thyroids decreased in size.

If this work remains confirmed, it is only necessary to educate the public and medical profession in order to reduce or nearly eradicate the occurrence of goiter, particularly in regions where it is endemic. It seems pertinent to inquire whether the development of adenomata is inhibited to the same degree as the simple colloid form. It is interesting to add to these observations those of Loeb<sup>77</sup> who found that the compensatory hypertrophy of the remaining thyroid after partial extirpation was not influenced by the administration of iodine.

**METHODS FOR DETERMINING THYROTOXICOSIS.** To me one of the most practical problems of the surgery of toxic goiter is the determination of the degree of toxicity. This has a practical bearing upon the choice of operation. Kocher told us ten years ago that in the blood picture we had a very important aid as to prognosis and laid emphasis especially upon the relative increase in the lymphocytosis, he looked upon the degree of lymphocytosis as an evidence of the degree of toxicity. While it is quite true that, as a rule, the degree of the lymphocytosis bears a relationship to the gravity of the case, I have not found it by any means a constant guide as to the operative risks or as to the tolerance of the patient to surgical therapy.

A study of the blood-pressure is often an important adjunct in the estimation of the patient's resistance, and I have been much impressed by the excellent study of Goodall and Rogers<sup>78</sup> who summarize their most important conclusions as follows:

(a) In typical and uncomplicated cases of Graves's disease the systolic blood-pressure is usually lower than normal, the diastolic pressure approximately normal, and the pulse-pressure consequently low.

(b) The systolic blood-pressure passes through three phases:

1. A short stage of primary hypertension. This is associated with the onset of the disease, and due to vasoconstriction owing to suprarenal stimulation.

2. A prolonged stage of hypotension. This is due to peripheral dilatation caused by a depressor substance secreted by the thyroid, and is of variable duration, but usually lasts for years.

3. A stage of secondary hypertension. This comes on late in the disease, and is associated with secondary changes in the cardiovascular system and reduced thyroid activity.

(c) After operation on the thyroid, the systolic blood-pressure tends to rise. This rise is not infrequently associated with cardiac acceleration and an irregularity of the pulse due to auricular fibrillation, and possibly in extreme cases followed by ventricular fibrillation resulting in death.

(d) A low systolic blood-pressure in Graves's disease, other factors being equal, indicates from an operation point of view: (i) Little myocardial exhaustion. (ii) A small post-operative rise in blood-pressure and consequently little liability to postoperative cardiac failure. (iii) Less hemorrhage.

<sup>77</sup> Journal of Medical Research, 1920, xli, 481.

<sup>78</sup> British Medical Journal, 1920, ii, 588.

(e) Diurnal variations in blood-pressure are considerable in Graves's disease, being relatively greater than in health.

The determination of the rate of basal metabolism and its application to toxic goiter has become the most important question under discussion relating to this interesting disease. No goiter clinic can be considered complete without an apparatus for determining the "metabolic rate." Studies of the basal metabolism, I believe, should be made routinely in all cases of hyperthyroidism or, for that matter, of hypothyroidism, with just the same regularity as one should take the white-cell count in appendicitis or examined the urine in diabetes. This is true not only because of its value in differential diagnosis but because of the parallelism between the other signs of toxicity and the basal metabolism.

A review of the steps whereby the estimation of basal metabolism became of clinical use in place of a purely physiologic study will be found in the papers by Else<sup>79</sup> and Dreger.<sup>80</sup> The papers of Dubois,<sup>81</sup> Means and Aub,<sup>82</sup> Sandiford,<sup>83</sup> Sturgis and Tompkins,<sup>84</sup> Means,<sup>85</sup> and others should be studied. I have a Benedict apparatus in my clinic and believe it will only be a short time when simpler means will enable the clinician to measure the basal rate of metabolism almost as easily as to take the blood-pressure. Means states that "So characteristic of thyroid disease are changes in the basal metabolism that personally I believe that in the metabolism level we have a functional test of that gland, increase of metabolism meaning hyperthyroidism, and decrease hypothyroidism, provided, of course, that other diseases that alter basal metabolism are excluded.

In following the course of Graves's disease, I believe that the basal metabolism furnishes the best index of the intensity of the intoxication that we have, and that it is a factor we always must have if we wish to treat this disease properly. Just as in following a case of pneumonia we study the temperature, pulse, and respiration curves, or in nephritis, the blood-pressure, water, salt, and nitrogen balance, so in thyroid diseases our chart should consist of metabolism curve, pulse curve, and weight curve, these being, without question, the three most important factors." He believes that while blood-sugar curves, adrenalin tests and differential blood counts are instructive, the metabolism level is essential. One point in Mean's last paper gives food for reflection. From a careful study of collected data he finds two reasonably distinct types, one in which there is an extreme elevation in pulse and a moderate elevation in metabolism, and the other in which there is an extreme elevation in metabolism and a moderate elevation in pulse. Eppinger has claimed that there are certain cases, which he calls the vagotonic type, in which the thymus plays a more important part than it does in certain others, which he calls sympatheticotonic, the latter type having among

<sup>79</sup> Northwest Medicine, 1920, xix, p. 171.

<sup>80</sup> Lancet, 1920, ii, 289.

<sup>81</sup> Archives of Internal Medicine, 1916, xvii, 915.

<sup>82</sup> Ibid., 1919, cexxi, 645.

<sup>83</sup> Endocrinology, 1920, iv, 71.

<sup>84</sup> Archives of Internal Medicine, 1920, xxvi, 467.

<sup>85</sup> Med. Clinics of North America, 1920, iii, 1077.

other things a more pronounced tachycardia than the former. Means suggests that the type where the pulse runs 10 or more points above the metabolism curve may be termed the sympatheticotonic variety and those in which the pulse runs coincident with or below the metabolism curve, the vagotonic variety. His experience has been that the prognosis in the type with greater elevation in pulse than in metabolism is better than it is in the type with high metabolism and moderate pulse elevation. In the first of these types it seems to matter very little, in regard to end-result, whether medical or surgical measures are employed; in the second type, however, that with high metabolism and moderate pulse elevation, recovery may take place with *x*-ray alone, but, in some of the cases, operation may be necessary. The important point is that in the latter type the risk of operation seems to be greater, but also there is some evidence to show that this risk may be reduced by exposing the thymus gland to the *x*-ray before surgery is undertaken.

Whatever may be the outcome of this test, we note the echo of it in all of the recent papers on toxic goiter. In the Mayo Clinic, Sandiford has published some interesting observations on the results of treatment. Some of the groups may be tabulated as follows:

1. 13 patients.	Rate +59 per cent.	After rest in bed	+46 per cent.
2. 16 patients.	Rate +54 per cent.	After first ligation	+44 per cent.
3. 22 patients.	Rate +46 per cent.	After second ligation	+39 per cent.
4. 19 patients.	Rate +31 per cent.	After primary thyroidectomy	+ 5 per cent.

In another series it was noted that a definite improvement from thyroidectomy in those patients who had had two ligations and a three months' rest was shown two weeks following operation by a decrease in the basal metabolic rate from plus 39 to plus 16 per cent., and in the pulse-rate from 107 to 89.

It is interesting to compare the influence of rest as given by Sandiford and the earlier statements of Means and Aub. They found that while the average rate in a group was reduced, after one to three weeks in bed, from +81 to +62 per cent., in no case was the metabolism brought to within normal limits by rest alone.

*Epinephrin Test.* Goetsch<sup>86</sup> elaborates further on the value of epinephrin sensitiveness in toxic goiter and believes it compares very favorably with the study of metabolic rate. I believe that with care in its use the test will be of great value to the general practitioner as a means of diagnosis and as a preliminary to more elaborate investigation.

*Blood-sugar Tolerance.* Wilson<sup>87</sup> finds this test of distinct importance in the early diagnosis of hyperthyroidism. The blood-sugar tolerance curve is an index to thyroid hypersecretion in those cases in which toxic secretion has manifested itself by a decreased glucose tolerance.

*Adenomata of the Thyroid.* Goetsch<sup>88</sup> continues his observations on the so-called "fetal adenomata."<sup>89</sup> He is almost of the opinion that this

<sup>86</sup> Pennsylvania Medical Journal, 1920, xxiii, 431, and New York State Journal of Medicine, 1920, xx, 282.

<sup>87</sup> Jour. Lab. and Clin. Med., 1920, v, 693.

<sup>88</sup> New York State Journal of Medicine, 1920, xx, p. 282.

<sup>89</sup> See PROGRESSIVE MEDICINE, March, 1920, p. 68.



is a new clinical entity which heretofore has very often escaped notice, and in which hyperthyroidism is produced principally by an increase in amount of the so-called fetal tissue in the thyroid, with also some increased activity in the thyroid alveolar cells. This, in a number of cases, was recognized by the increased concentration of mitochondria in the cells. The gland is usually mildly to moderately enlarged, fairly uniformly; it has an elastic, firm feel and at operation is seen to be more or less adherent to the surrounding structures. The capsule is thickened, there is some increased circulation particularly, it seems, of venous nature, and the characteristic features are more particularly seen in the microscope. There is an increase of the interstitial so-called "fetal cells." There are numerous nests of very small, newly-formed acini. The remaining larger acini vary greatly in size. The alveolar walls are often wavy; the cells are cuboidal to low columnar, and oftentimes aggregations of lymphoid cells are characteristically seen. Basing his opinion on the finding of mitochondria in the thyroid cells, Goetsch believes that clinical hyperthyroidism can be produced purely on the basis of hyperplasia of the interstitial tissue springing from the fetal cells of the thyroid and is not necessarily due to primary activity of the parenchymal cells. This would be the case in nodular adenoma or in cases of so-called "diffuse adenomatosis" where the fetal or young cellular tissue is sprinkled diffusely throughout the gland. On the other hand, he has been able to show that hyperthyroidism may be dependent upon a primary mild overactivity of the parenchymal cells, with less evidence of fetal cell overgrowth, as in puberty hypertrophy.

Crile<sup>90</sup> finds that clinical evidence of the functional activity of adenomata is found in the frequent development of symptoms identical with those which are characteristic of exophthalmic goiter, and in the disappearance of these symptoms after the removal of the adenoma. In view of these facts, the following questions arise: Are these clinical symptoms of so-called toxic adenomata due to a degeneration of the adenoma—such as may occur as a result of the degeneration of fibroid tumors? Are they due to such changes as are produced by a chronic toxemia from infection of the gall-bladder, of the teeth, tonsils, bones, etc., or by intestinal toxemia? Or are they due to the thyreo-iodine which is fabricated by the adenoma? That the last of these queries suggests the true interpretation appears to be indicated not only by the identity of symptoms referred to above, but also by the fact that the well-developed "toxicity" from the toxic goiter produces a sensitization of the organism to adrenalin identical with that present in cases of hyperplastic goiter which are associated with exophthalmos and the other characteristic symptoms. In fact, with the exception of exophthalmos, all the characteristic symptoms of true exophthalmic goiter may be present in cases of "toxic adenoma"—increased basal metabolism, tachycardia, increased respiration, nervousness, tendency to fever, low thresholds, emaciation, increased appetite. Judd<sup>91</sup> also writes on adenomata. He compares 100 consecutive cases of each. He finds that the

<sup>90</sup> *Annals of Surgery*, 1920, lxii, 141.

<sup>91</sup> *Ibid.*, 145.

toxic adenomas are usually those in which an innocent enlargement of the thyroid has existed for a long time. In our series patients with this type of goiter had had an enlargement on an average of almost twenty years before it was associated with symptoms of hyperthyroidism. In the cases of exophthalmic goiter this interval was usually less than one year. Acute crises of hyperthyroidism are not so liable to occur in cases of toxic adenoma as in cases of exophthalmic goiter; the toxic features develop more slowly and are progressively noticeable. Frequently the cardiac symptoms predominate and not infrequently those cases are regarded as "heart disease." There is also a tendency for these cases to be hypertensive. The basal metabolic rate is always increased, but does not average so high as in exophthalmic goiter.

#### EXOPHTHALMIC GOITER.

Patients cured . . . . .	58 (65.8 per cent.)
Patients markedly improved . . . . .	12 (13.6 per cent.)
Patients slightly improved . . . . .	5 (5.6 per cent.)
Patients died from all causes during the six years . . . . .	15 (15.0 per cent.)

#### ADENOMA WITH HYPERTHYROIDISM.

Patients cured . . . . .	83 (83.0 per cent.)
Patients markedly improved . . . . .	5 (5.0 per cent.)
Patients slightly improved . . . . .	1 (1.0 per cent.)
Patients not benefited . . . . .	2 (2.0 per cent.)
Patients died from all causes during the two years . . . . .	9 (9.0 per cent.)

C. H. Mayo<sup>92</sup> states that the average metabolic rate following operation and partial thyroidectomy, or removal of the adenomatous mass, falls from +35 per cent. to +7 per cent., usually within two weeks. This rapid drop in metabolism is in contrast with the result obtained from thyroidectomy in cases of exophthalmic goiter with an average basal rate of +36 before operation; the rate is within normal limits within two weeks in only 45 per cent., although it is below +14 per cent.

*Resection and Ligation.* Whether to begin the operative treatment with a resection or with a preliminary ligation, I think admits of no discussion. It has been my practice to resort to preliminary ligation when there is the least doubt as to the propriety of a resection, and as time goes on I find the number of preliminary ligations is increasing rather than decreasing, and single ligation I prefer to double ligation at one or two weeks' intervals. As a rule, with a metabolic rate over 60, I always practice preliminary ligation, and in cases of lower metabolic rate when the other signs of great toxicity are evident in the rapid pulse, much loss of weight, restlessness, sleeplessness, and particularly marked vasomotor disturbances. I believe there are sound anatomical reasons for selecting the superior pole and I always surround the pole with two ligatures and divide all the tissues between, which includes thyroid tissue, cervical sympathetic fibers, lymphatic vessels, in addition to the arteries, that is the main trunk and its posterior branch.

<sup>92</sup> *Annals of Surgery*, 1920, lxxii, 134.

The step-like succession of treatment is succinctly stated by Crile: In extremely grave cases it may be necessary to diminish the thyroid activity by multiple steps; ligation of one vessel; ligation of the second vessel; partial lobectomy; complete lobectomy; when necessary allowing intervals of a month or more between any two of these stages. If, during operation the pulse runs up beyond the safety point, the operation is stopped and the wound dressed with flavine, the operation being completed after a day or two, when conditions are safe. In some cases, though the thyroid is resected, it is advisable to dress the unsutured wound with flavine and make a delayed closure in bed the following day under analgesia. The only important authority dissenting from preliminary ligation is Dunhill,<sup>93</sup> and he believes that "he operates on cases with a severer grade of the disease than do most surgeons." Crile<sup>94</sup> has operated on 100 per cent. of 300 cases of exophthalmic goiter, with three deaths (1 per cent.). Dunhill does not state his operability or his results. DeCourcy<sup>95</sup> objects to preliminary ligation on the ground that it imposes an unnecessary interval on the patient before final treatment and the high "basal rate" of plus 39 (Sandiford) persisting after operation is harmful to the human organism. He reports 130 patients operated on, with one death, but his opinion is rather discounted by the rejection of 7 cases because of their advancement. This subject is further elaborated by Judd<sup>96</sup> and by Sistrunk<sup>97</sup> and need not be pursued further.

*Cold in the Treatment of Hyperthyroidism.* According to Crile<sup>98</sup> the cause of death in acute postoperative hyperthyroidism is excessive chemical activity. Therefore the urgent need in these cases is a safe means by which this excessive chemical activity may be controlled. It is known that with each degree of rise in temperature, the chemical activity within the organisms is increased 10 per cent.; that is, if the temperature of a patient has risen to 106° his metabolism has increased 70 per cent. Conversely, with each degree of fall in temperature, the metabolism will decrease 10 per cent. Once convinced that this physical-chemical principle held true for hyperthyroidism, we literally packed these cases in ice and have found that this procedure acts almost specifically in controlling the destroying metabolism. The patient is covered with a rubber blanket, surrounded and covered with broken ice, and an electric fan is used to promote evaporation. In 1 case the postoperative temperature was 106°, the pulse rose to 200; the patient was delirious and dying. He was packed in ice, and in two hours the temperature was reduced to 99.2°, the pulse to 140, and the patient was conscious and on the road to recovery (Fig. 18).

*X-ray Treatment of Toxic Goiter.* There is not much literature on this subject this year. Last year I referred to certain reports of death following x-ray treatment, presumably caused by the aggravation of the toxic

<sup>93</sup> British Journal of Surgery, 1919, vii, 195.

<sup>94</sup> Annals of Surgery, 1920, lxxii, 141.

<sup>95</sup> American Journal of Surgery, 1920, xxxiv, 282.

<sup>96</sup> New York State Journal of Medicine, 1920, xx, 387.

<sup>97</sup> Journal of the American Medical Association, 1920, lxxiv, 306.

<sup>98</sup> Surgery, Gynecology and Obstetrics, 1920, xxx, 27.



state. I overlooked a paper by Nordentoft<sup>99</sup> who describes his impressions based on 100 cases. In every case, he says, great improvement was effected. The area exposed was invariably confined to the region of the thymus, a practice marking the significance attached by the author to

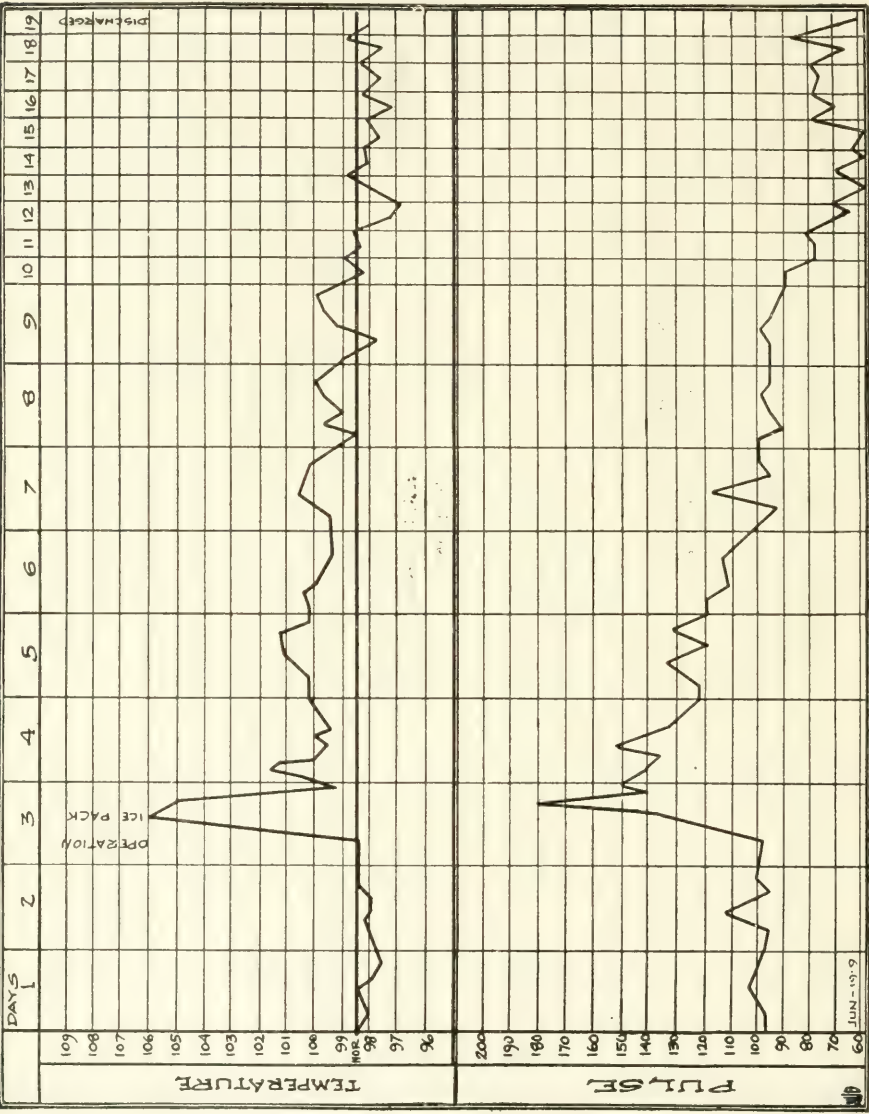


Fig. 18—Ice pack for hyperthyroidism. (Crile.)

the thymogenic origin of Graves's disease. Discussing the recent publication of x-ray fatalities in cases of Graves's disease, he regards a certain number as inevitable in spite of, not because of, this treatment. Other fatalities are of thymogenic origin—the result of neglecting to

<sup>99</sup> Abstract in British Medical Journal, 1920, i, Epitome p. 13.

submit the thymus to the *x*-ray treatment. Again, one large dose is much safer than several small doses. The author concludes that if *x*-ray treatment is prescribed early, and the system of single "massive" dosage be adopted, several cases and deaths will become exceedingly rare.

In the extremely toxic cases, I always prescribe *x*-ray treatments, but the results have not been altogether satisfactory. It is in those cases in which there is the slightest suspicion of an enlarged thymus that irradiation should be employed. There is not the least doubt that an enlarged thymus is responsible for many of the sudden deaths following operation, and irradiation should be prescribed and practised in all such cases preliminary to operation.

With regard to the *x*-rays therapeutics in general, all the reports which I have seen deal in generalities and do not give in detail the end-results. The writers of these reports would lead us to believe that the results are almost uniformly good and one would infer better than the result of surgery. The insinuation is made also that *x*-ray therapy is without danger in itself. To this, however, I take exception; in the first place, Holmes and Merrill<sup>100</sup> tells us that the gland may be destroyed and a state of hyperthyroidism produced if the treatment is pushed too fast. The changes go on in the gland some time after treatment is discontinued. Secondly, the toxemia may be increased to a dangerous degree by the first treatment and cases have been recorded (Secher) in which the reaction following Roentgen therapy has been fatal. Thirdly, the increase in connective tissue makes subsequent operation more difficult.

I regret my inability to abstract a paper by Cordua,<sup>101</sup> but the journal is not available here. Hubeny<sup>102</sup> also mentions the possibility of hypothyroidism as well as telangiectasis and atrophy of the regions treated. He believes that these changes are more liable to occur when unfiltered rays are used, or repeated erythema is produced. The first treatment may increase the toxemia to a dangerous degree. To guard against this, the patient should rest in bed before the treatment is begun, and at first only small doses should be given. When surgery has been employed and has not resulted in a complete cure, great caution is necessary as the danger of hypothyroidism is greater. The treatment should not follow operation too soon and should not be prolonged. Boggs<sup>103</sup> and Aikins<sup>104</sup> have also written on this subject. The latter uses radium and claims the same beneficial results as with the *x*-ray, together with certain added advantages. Means and Aub arrive at the following conclusions regarding this subject: In the third year after treatment was well established, the end-results in the surgical and roentgen-ray groups were identical, *i. e.*, group averages of +13 per cent. in each case and all the patients leading normal lives. In the roentgen-ray group the improve-

<sup>100</sup> Journal of the American Medical Association, 1919, lxxiii, 1963.

<sup>101</sup> Mittheil. a. d. Grenzgeb d. Med. und Chir., 1920, xxxii, 283.

<sup>102</sup> Illinois Medical Journal, 1920, xxxvii, 383.

<sup>103</sup> Am. Jour. Roentgenol., 1919, N.S. 6, 613.

<sup>104</sup> Med. Press, 1920, N.S. 110, 25.

ment was gradual, but progressive. In the surgical group, a sudden marked improvement was followed by a subsequent relapse. In groups of cases of equal toxicity, it would seem that the chance of cure in exophthalmic goiter is as good with roentgen-ray treatment as with surgery. The relationship between metabolism, weight, and pulse, in about 60 per cent. of the cases, showed a close parallelism, and in the remainder a certain amount.

*Anesthesia in Goiter Operations.* We should find some general agreement among surgeons of large experience in goiter work, regarding the important matter of anesthesia, but instead there is wide divergence. Following Kocher's teaching, most of the German surgeons use local anesthesia. I note, for instances, that Holz,<sup>105</sup> with an experience of 400 cases, uses it, and Kulenkamoff<sup>106</sup> enthusiastically endorses the Hartel method of regional anesthesia, injecting at the third and fourth cervical roots. Dunhill<sup>107</sup> performs most of his operations under local anesthesia, although he seems to prefer "open ether" for the thyrotoxic cases. In a symposium<sup>108</sup> before the anesthetic section of the Royal Society, Berry strongly favored ether and stated that he had entirely abandoned the use of chloroform.

In the discussion in the symposium on "goiter surgery" at New Orleans last year, Eastman<sup>109</sup> urged the use of local anesthesia, and was supported by Harris. Crile objected to its use on account of the important psychic factor, and Goetsch and Crotti were in accord. Crile does use local anesthesia, as does Lahey, of Boston, but they add nitrous oxide to produce analgesia. At the meeting of the American Association of Anesthetists (1920), Crotti stated that he had found nitrous oxide too fraught with abrupt complications difficult to handle or avoid, except by the most expert anesthetists. At this meeting, Blair had the right idea when he said that the similarity of results obtained by different men, who, with large experience, have concentrated on a certain method of anesthesia, does not mean that there can be no elements in the particular case pertaining to the choice of the anesthetic, but rather that the proper correlation of the anesthetic to the technic is of vastly more importance than the particular anesthetic agent employed. Those who employ a general anesthetic with the best results are the men who produce the least psychic shock, operate quickly with the least traumatism, and remove large amounts of the toxic gland. While in general agreement with the statements of Blair, I do not think that local anesthesia alone has any place in the management of the operation on the toxic goiter patient. The method of ether-oil colonic anesthesia has found favor in the hands of Lathrop<sup>110</sup> after an experience of 500 cases. Certain patients are too acute mentally to undergo anociation a second time, and if the psychic factor is still prominent I think that Lathrop's

<sup>105</sup> Schweiz. Med. Wehnschr., 1920, I, 6.

<sup>106</sup> Zent. f. Chir., 1920, xlvii, 246.

<sup>107</sup> British Journal of Surgery, 1919, vii, 195.

<sup>108</sup> Proc. Roy. Soc., London, 1920, 13, Sect. Anes. 45.

<sup>109</sup> Journal of the American Medical Association, 1920, lxxv, 166.

<sup>110</sup> Ibid., lxxiv, 83.



method might be applicable to them as a variation in the scheme of anociation.

*Variations in Technic.* Mason<sup>111</sup> advocates fractional cauterization of the gland in bad cases as a preliminary treatment to ligation or in replacing ligation. Through small incisions the gland is exposed and the field made dry. Then an electric cautery, while cold, is passed through the incision down to the anterior surface of the gland. The current is turned on and the cautery rocked slowly from side to side, a

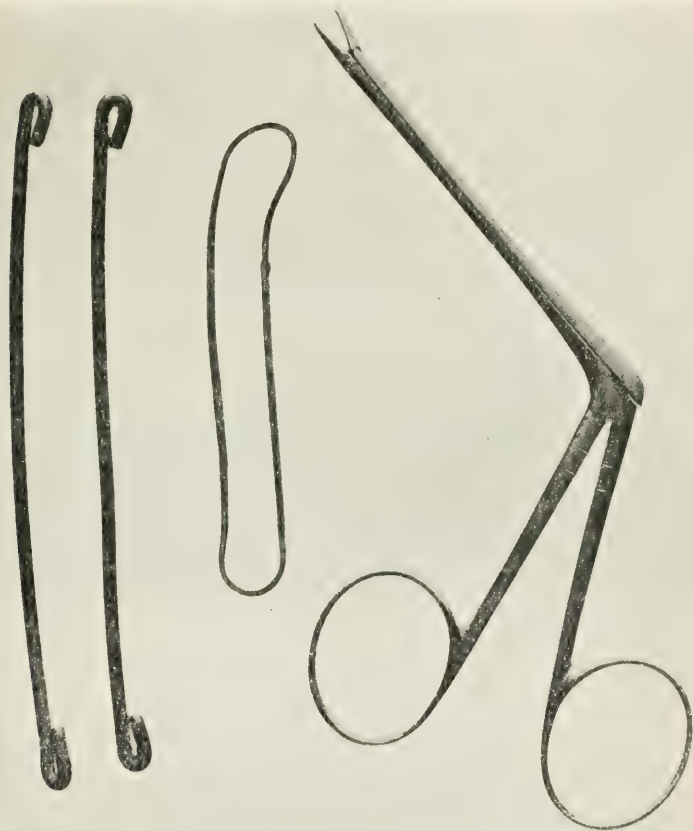


FIG. 19.—Showing wires, rubber bands and alligator forceps.

piece of gland about the size of a shoe button being destroyed, and causing coagulation of a much larger area. No sutures are inserted, but two or three clips are used for closing the skin. Petrolatum is applied to the outside of the wound to prevent the first dressing from sticking. This procedure may be repeated every few days, destroying larger portions of the gland until the patient is considered a safe risk for ligation

<sup>111</sup> Journal of the American Medical Association, 1920, lxxv, 160.

or thyroidectomy. Further incisions are made 2 cm. apart, care being taken to keep them in the same line as the future collar incision for thyroidectomy. The usual collar incision later will manifestly obliterate all external evidence of the cauterization.

I must agree with Goetsch in the discussion on this paper when he criticized the redevelopment of operations which are more mutilating than ligation. In the same symposium, Bartlett advocated leaving all of the clamps on the stump. He is afraid of the retention of toxic products and the method secures complete drainage. Ochsner, very properly, stated his doubt of the wisdom of this procedure. The amount of shock avoided by the few moments of taking off clamps will usually be greatly multiplied by the annoyance of leaving them on. Freeman<sup>112</sup>

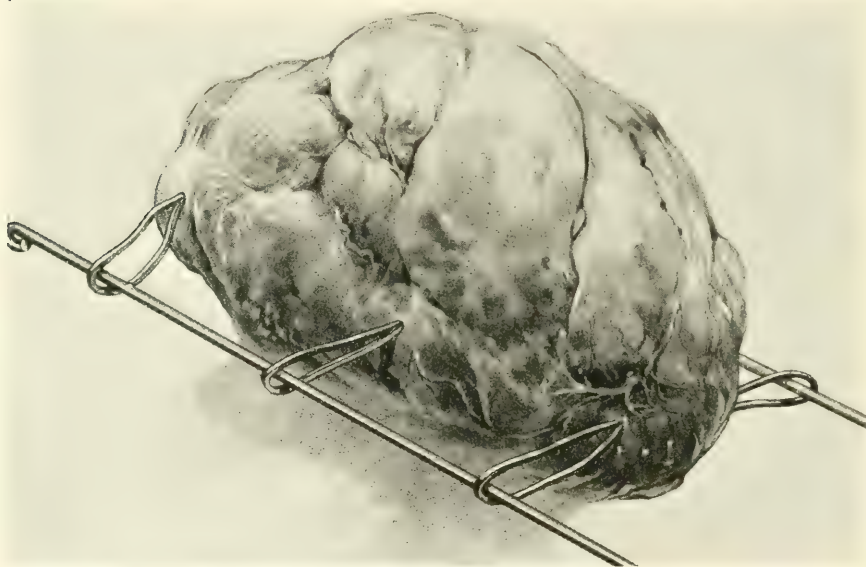


FIG. 20.—Rubber bands drawn through the base of lobe and wires inserted through the projecting loops on either side.

offers a substitute for the use of large forceps sometimes used to grasp the dislocated lobe during resection. He has used the method in 182 operations. The illustrations are self-explanatory (Figs. 19 to 22).

*Loss of Both Eyes from Exophthalmos.* Lahey reports an unusual and interesting case illustrating the extent to which the exophthalmos of hyperthyroidism may progress. The patient had been treated by x-ray with a resulting improvement generally, but with a progressive increase in exophthalmos until edema and corneal ulceration became so acute as to necessitate removal of the right eye. Because of the belief that recession of the protruding eye occurs after removal of the sympathetic ganglion on the affected side, the operation of removal of the superior cervical sympathetic ganglion was carried out, without diffi-

<sup>112</sup> *Annals of Surgery*, 1920, lxxii, 161.

culty, and at the same time the external canthus was incised to relieve the pressure of the lid edges. Progress of the edema continued in spite

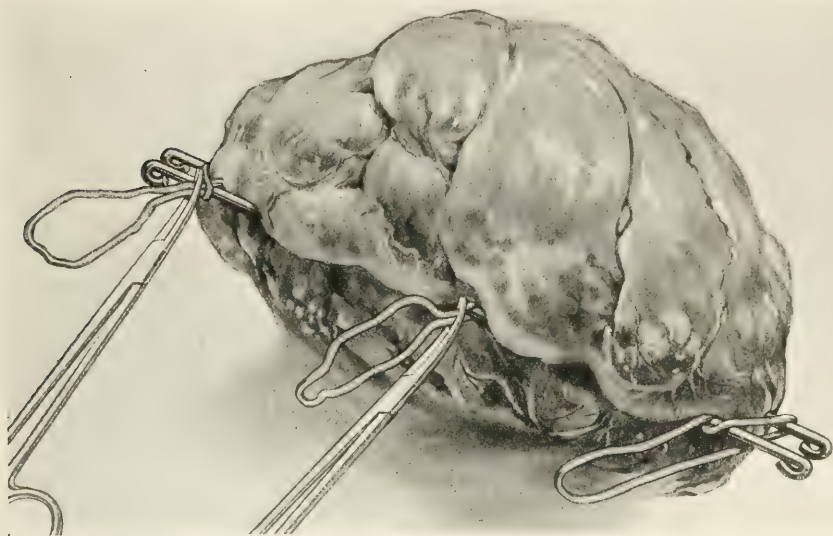


FIG. 21.—Rubber bands drawn taut and held by forceps, the end bands having been wrapped around the extremities of the wires.

of these procedures, whereupon, two days later, the lids were sutured together.

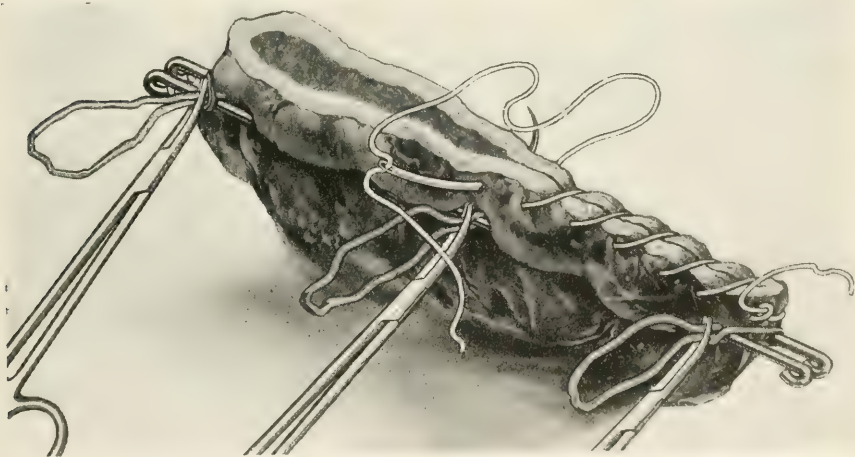


FIG. 22.—Showing wedge-shaped excision and method of inserting hemostatic suture. (For the sake of clearness the "cuff" is pictured unnecessarily wide and thick.)

The edema and ulceration continued and it was necessary to enucleate the remaining eye. Lahey remarks that "Were such a case to occur



again, I would certainly employ removal of the sympathetic ganglia, and at a much earlier stage of the disease; furthermore, while I am sure that *x-ray* treatment in no way caused the condition, I would employ surgical removal of a considerable portion of the gland, rather than *x-ray* treatment, as the relief from hyperthyroidism (of which the exophthalmos is a part) is more complete and immediate after the surgical procedure than that which follows *x-ray* treatment." In this connection, I might add that Leriche<sup>113</sup> suggests pericarotid sympathectomy as a possible cure for exophthalmos.

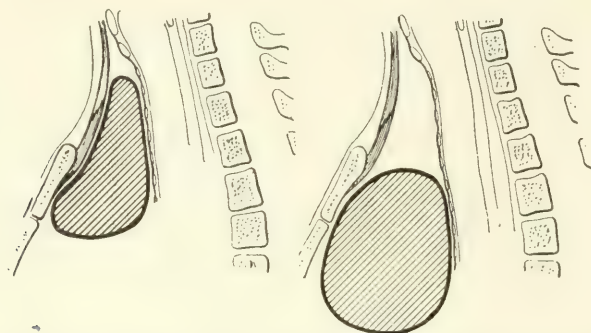


FIG. 23.—Intrathoracic mass shown incompletely and completely, illustrating how, with increased diameter, the upper pole of the mass is drawn into the thorax. (Lahey.)

*Intrathoracic Goiter.* Lahey<sup>114</sup> believes that too little attention has been directed to intrathoracic goiter, and that it should be diagnosed before the growth has reached such proportions as to threaten life by obstructing respiration. Schwyzer<sup>115</sup> also is impressed with the importance of this variety of goiter. Both discuss the technical features of the operation. In addition to respiratory obstruction, the diagnosis is established by the roentgen ray revealing a substernal shadow and bowing or deviation of the trachea. Lahey explains the descent of the goiter by the pressure of the anterior group of neck muscles, the movements of deglutition, and the lack of resistance below. In the case of completely intrathoracic thyroid growths, the adenoma or cyst, free in the gland, enlarges in size; if the axis diameter is below the level of the top of the thorax, the tumor descends by reason of the outflaring walls of the chest (Fig. 23).

### THE MAMMARY GLAND.

**Development of the Mammary Gland.** Meyer<sup>116</sup> has followed the development of this gland from its earliest appearance until the period of pregnancy. The gland is first represented in the embryo by the "mammary streak" a single layer of elongated epithelial cells extending on each side from the anterior to the posterior limb bud. By proliferation

<sup>113</sup> Presse Med., 1920, xxviii, 301.

<sup>114</sup> Journal of the American Medical Association, 1920, lxxv, 163.

<sup>115</sup> Ibid., lxxiv, 597.

<sup>116</sup> American Journal Diseases of Children, 1919, xviii, 14.

of these cells resulting in the formation of several layers is formed the "mammary line" which is slightly elevated above the epidermis. The cell proliferation then continues only at intervals along the line and in this way forms what are called mammary hillocks. The intervening portions of the line gradually disappear. As the hillocks grow, they sink into the subadjacent mesenchyma and begin to bud from their deeper surfaces. The buds which divide progressively and sink into the mesenchyma represent the future "milk ducts." In man there are 15 or 20 primary buds in each hillock. In man, the lumen to the milk duct begins to develop in about the sixth or seventh month. At birth the ducts show considerable branching and soon after birth secretion appears in the milk ducts of human infants. This secretion, which may cause marked engorgement, is usually carried away by the leukocytes or by direct absorption within twenty or thirty days. Post-mature children may have secretion at birth, while prematures may not have it until many days after birth. The secretion contains all the constituents of true milk. The stroma of the mammary gland develops from remnants of the mesenchyma about the mammary hillocks. As the hillock sinks into the mesenchyma, its superficial surface becomes depressed below the level of the surrounding epidermis by a process of degeneration and desquamation by which is formed the "mammary pit." Soon after this, a small papilla is seen in the base of the pit. This is the beginning of the nipple and it grows until it fills the pit. The nipple becomes elevated shortly after birth and is of adult size and form at puberty. In the human each of the 15 to 20 milk ducts has a separate "pore" on the surface nipple. Seven per cent. of the human embryos develop supernumerary mammary glands along the course of the original mammary streak. In the human "witch's milk" is secreted by both sexes. Up to puberty, milk ducts in the female branch more than in the male. Retrogressive changes are apparent in the male gland after the thirtieth year.

**Traumatic Fat Necrosis of the Breast.**<sup>117</sup> Two cases of fat necrosis of the breast following trauma are reported. Both patients were large women with more than the normal amount of fatty tissue. Both had a definite history of trauma—one had received a blow and the other had had hypodermoclysis introduced at the point of her lesion. Both women accidentally noticed the small tumors when about the size of a walnut. They were painless, hard and attached to the overlying skin. In one there was one soft lymph node palpable in the axilla, none in the other woman.

After removal, the gross appearance was of a large area of opaque discolored at tissue, nearly diffuent in the center, surrounded by a broad zone of cellular granulation tissue.

**Gumma of the Breast.** Tertiary syphilitic lesions of the breast are rarely seen, yet as early as 1736, Astruc mentions it, and in 1768 Sanvages reported a case of bilateral mammary tumor in a syphilitic woman. The tumors which were the size of an egg, hard and irregular, entirely disappeared under mercurial treatment. In the French literature we

find reports of Yvaren, Verneuil, Richet, Velpeau and Lancereaux on this condition. In all, about 50 cases have been reported.

The pathology of gumma of the breast has been left untouched though Reinecke, in 1899, described a luetic mastitis in which there were many yellowish red or red foci, the size of a pinhead, elevated above the cut surface which was firm and dry. These small projections were due to proliferation of the inter- and intralobular connective tissue which was replacing the degenerated glandular cells. All the vessels, but particularly the arteries, were thickened.

The tumors in their clinical aspect do not differ markedly from other breast tumors, and it is difficult to make a positive diagnosis though if it has undergone softening and ulceration it is somewhat easier.

Gummata occur about three times more often in women than in men. They may be in any part of the breast and they may be bilateral, they are not adherent to the skin, as a rule, but are freely movable, hard masses. They are seldom painful but they may be very tender on pressure. The lymphatic glands are usually not involved, though in several cases reported they have been enlarged.

Loyd Thompson<sup>118</sup> says, in reporting his case, that gumma must be differentiated from chancre, abscess, benign tumor, carcinoma, sarcoma, tuberculosis, actinomycosis and sporotrichosis—in short, all the conditions affecting the breast. The acute abscess, with temperature, pain, hyperemia and fluctuation, should present no difficulty. Benign tumors and sarcoma are almost impossible to differentiate without section, though they may occur in patients with negative Wassermann reactions, and this will help in eliminating gumma, though the reaction is not always positive when the lesion is a gumma. In tuberculosis of the breast, the axillary glands are enlarged and sinuses form early, with the tubercle bacilli present in the discharge. Actinomycosis and sporotrichosis are also differentiated by finding the causative agent in the discharge or on section. In a syphilitic patient below the cancer age with a nodular breast, tumor which is circumscribed, freely movable, and with no glandular involvement, the therapeutic test may be applied and anti-syphilitic treatment given. In view of the difficulty in differentiating this from conditions in which early operation is essential, it would hardly seem justifiable to delay operative procedure for more than three weeks if there are no results from intensive treatment.

Thompson reports a case of a woman, aged thirty-three years, who complained of a lump in the breast. The husband was syphilitic, and the patient had had two miscarriages. Nine months before she noticed the lump in her breast she had pains and nervous twitchings in her neck, arms, and legs. Her Wassermann reaction was positive one year before. On examination, nothing was found abnormal except a sluggish left knee-jerk and the tumor in the left breast which was 4 inches long, and from 1 to 1½ inches in diameter and of horseshoe shape. It was not tender. The Wassermann reaction was positive. A diagnosis of gumma was made and the patient was placed on intensive acute syphilitic

<sup>118</sup> Journal of the American Medical Association, March 20, 1920, lxxiv, 12.



treatment with mercury, iodides and arsphenamin. In six weeks the tumor had diminished in size, and, when last seen, five months later, it was much smaller and had divided into two parts.

**Malignancy of the Breast in the Male.** The combined results of the findings of Primrose, Judd and Deaver show that 88 per cent. of all carcinomas of the breast occur in the male. Schuchard found that of all tumors of the breast, 2 per cent. occurred in the male. In view of the frequency with which carcinoma occurs in the female breast, even this disproportion will yield a considerable number of cases in the male. Schuchard, in 1884, collected 348 cases.

Forgue and Chauvin<sup>119</sup> collected 18 cases of primary melanotic tumors of the male breast; they found the age to vary from ten to sixty-nine years, with an average age of forty-nine. Of 13 cases with histological examination, 8 of these were sarcomas, and 5 carcinomas. They arose either from the skin or deep in the tissue. They were not as malignant as pigmented tumors usually are.

A case of cancer in the breast of a man of seventy was reported by B. N. Calcagno<sup>120</sup> and a case of Paget's disease in a man of forty-five by Willy Meyer.<sup>121</sup> In the former case the postoperative radium treatment was followed by necrosis, with slow healing, while in the second case metastasis occurred resulting after a conservative operation of extirpation of the breast without the axillary glands. Although a radical operation was performed one and three-quarters years later, the patient died.

**Sarcoma of the Breast.** Sarcoma of the breast is not a common disease. It comprises from 2 to 8 per cent. of all mammary tumors. It originates in the connective tissue of the breast tissue, either deeply placed or starting in the upper, outer quadrant as a rule. It is usually classified as one of two types, (a) the round-celled, which is the rapidly-growing and often quickly-infiltrating form, and (b) the spindle-celled sarcoma or fibrosarcoma, which grows less rapidly and is more limited.

Miles F. Porter,<sup>122</sup> among 77 cases of tumors of the breast, reports one lymphosarcoma, and Davis<sup>123</sup> reports one in 166 patients with malignant tumors. Sarcoma of the breast occurs usually in women and usually between the ages of thirty and forty. Graves<sup>124</sup> reports a case of sarcoma occurring in a woman, aged ninety-eight years. The lesion was noted three and a half months previously. The breast was not enlarged, but was painful and had several hard, small masses scattered through it. The axillary lymph glands were not enlarged. Operation was not undertaken and the breast rapidly increased in size and soon attained the size of a football. It was found to be a spindle-celled sarcoma with pulmonary metastasis.

Forgue and Chauvin<sup>125</sup> discuss primary melanomas of the male breast.

<sup>119</sup> Rev. de Chir., Paris, 1919, 38.

<sup>120</sup> Revista de la Asoc. Medica, Argentina, December, 1919, xxxi, 181.

<sup>121</sup> Annals of Surgery, 1920, lxxii, 2.

<sup>122</sup> Surgery, Gynecology and Obstetrics, 1920, xxxi, 584.

<sup>123</sup> Annals of Surgery, 1920, lxxi, 270.

<sup>124</sup> British Medical Journal, January 17, 1920.

<sup>125</sup> Rev. de Chir., Paris, 1919, 38.

Of 13 cases in which histological sections were examined, 5 were carcinomas, the other 8 being melanotic sarcomas, for the most part spindle-celled.

**Pathologic Anatomic Findings in Prognosis of Mammary Cancer.** Iselin<sup>126</sup> has reviewed the literature on the ultimate fate of breast cancers classified according to their histologic structure. He discusses the conflicting presumptions as to prognosis based on pathologic anatomic findings. Of 102 of the author's cases recently reviewed, 27 had a scirrhus carcinoma. All but 4 had died within five years, while of the 56 with simple hard cancer 33 per cent. were living after five years or more, and 10 per cent. were alive from ten to fifteen years later. Of 13 with medullary carcinoma, 66 per cent. survived from five to sixteen years. The cause of the higher mortality in scirrhus cancers, Iselin thinks, is due to their slow growth and the fact that they cause so little disturbance until far advanced. The small cells of scirrhus cancer spread in all directions continuously and involve the surrounding regions more readily than other cancers. All the cases surviving for a considerable period had the large cells, but in a few early cases the cells had also been large. Forgue and Chauvin<sup>127</sup> in discussing primary melanomas of the male breast, says that the pigmented tumors of the mamma do not show the high degree of malignancy characteristic of melanomas in general. Porter thinks that the character of the discharge from the nipple does not indicate the character of the growth, so far as the question of malignancy is concerned. One may have either a bloody or clear discharge from the nipple in either benign or malignant trouble.

**End-results in Carcinoma of the Breast.** These are always interesting, especially in comparison with those published in past years. Leander,<sup>128</sup> analyzes the experiences at Stockholm with 427 operations for mammary cancer between 1900 and 1914. The 330 radical operations were followed by recurrence in or near the site of the cancer in 165 cases. Nineteen per cent. were living free from recurrence after three years; 28 patients were thus apparently definitely cured. After five years these figures were 16.8 per cent. and 24. The outcome in 84 cases is unknown. Over 66 per cent. of all recurrences developed in or near the old site.

Perthes<sup>129</sup> compares the ultimate outcome of 88 cases of mammary carcinoma rayed after amputation with 130 cases not given post-operative irradiation, and 70 cases in which inadequate exposures were made. There was a recurrence within a year in 41 per cent., 28 per cent., and 38 per cent., respectively in these groups, but in the recurring cases there was no local recurrence in 18, 11 and 11 per cent. respectively. The recurrences within a year were almost twice as numerous as in the unrayed cases, and deaths from internal metastasis were four times as numerous. Iselin<sup>130</sup> thinks the fact that so many of his irradiated cases—even those with involvement of the farthest glands in the supra-

<sup>126</sup> Schweiz. Med. Wchnschr., 1920, 1, 22.

<sup>127</sup> Rev. de Chir., Paris, 1919, 38.

<sup>128</sup> Hygiea, 1919, lxxxi, 23, 937.

<sup>129</sup> Zentralblatt für Chirurgie, 1920, xlii, 2, 25.

<sup>130</sup> Schweiz. Med. Wchnschr., 1920, 1, 52.

clavicular fossa—survived for longer intervals is impressive testimony to the value of postoperative raying.

Davis<sup>131</sup> reports 101 cases of carcinoma of the breast, 63 are free of the diseases for periods ranging from three to twenty-one years. Of the 38 remaining, 36 have died of local or disseminated cancer, and two yet living are suffering from recurrence. One of the cases free from recurrence had a bilateral carcinoma of the breast.

Willy Meyer<sup>32</sup> says that statistics regarding the results of the radical operation for cancer of the breast are worthless. The fate of the patient depends on the so-called virulence of the disease. He reports 6 cases alive and well today, from twelve to twenty-five and a half years after operation. Six other cases remained free from recurrence for four, six, eight (2) and sixteen years respectively, and then died of other diseases.

Miles F. Porter<sup>133</sup> reported the late results of cancer of the breast. Thirteen had involvement of the axillary glands at the time of operation—of these 4, or 30 per cent., are living and well five years or more after operation; 3, or 23 per cent., after three years or more; 4, less than three years. One had a recurrence and 1 is dead. Seven cases had no gland involvements. Of these, two are living and well after five years or more; and the remaining 5 are living and well within the three-year period. One of those reported as well within the three-year period had a secondary operation for a recurrent nodule in the spring of 1916. Of the patients who are dead, two had both metastatic and local recurrence. Six had no local recurrence, but metastasis only.

<sup>131</sup> *Annals of Surgery*, 1920, lxxi, 270.

<sup>132</sup> *Ibid.*, vol. lxxii, p. 177.

<sup>133</sup> *Surgery, Gynecology and Obstetrics*, 1920, xxxi, 6, 584.





# SURGERY OF THE THORAX, EXCLUDING DISEASES OF THE BREAST.

By GEORGE P. MÜLLER, M.D.

## SURGERY OF THE HEART.

**Heart Massage.** Fisher,<sup>1</sup> writing upon "Resuscitation in Death Under Anesthesia," states there appears to be a need for the greater advocacy of cardiac massage as a method of resuscitation in death and impending death under anesthesia. He points to the fact that in the voluminous correspondence in the *British Medical Journal* during 1919 and 1920, regarding sudden death from anesthesia, no mention of cardiac massage having been practised was uttered. Further in his article he mentions prejudice, unfamiliarity and fear of peritoneal contamination as objections which are not valid. I think the most important is that of unfamiliarity with the method and the fact that so many patients pull through after the institution of artificial respiration. As Fisher states, it is quite probable that the latter, by reason of the rhythmic variations of intrathoracic pressure, promote blood flow and stimulate the heart. He believes, however, that in the Sylvester method the reversal of the normal action of the diaphragm (inactive, atonic, and relaxed) discounts the advantage gained, and hence it is imperative to augment lung ventilation by Howard's modified plan, an assistant making expiration more effective by the application of pressure over the epigastric zone and so elevating the diaphragm, and supplementing the inspiratory movement by suddenly removing the pressure exerted; this effects a simultaneous descent of the diaphragm and costal elastic recoil.

The proper procedure would seem to be the preparation for cardiac massage in all cases of cessation of the heart beat and its institution within a very few minutes—ten, according to Fisher—if artificial respiration fails to restore the beat. He says that beyond a period of half an hour no measure whatsoever will avail, and he points to the profound and prolonged nervous disturbances reported in certain of the recovered cases after delay for more than the ten minutes.

**TECHNIC.** It seems worth while to discuss the technic of heart massage once more. Fisher prefers the subdiaphragmatic method and describes it thus: An opening is made in the epigastrium to the left of the middle line, and large enough to admit a hand, which is passed, palm upward, between the left lobe of the liver and the diaphragm. The fingers are pushed well backward and upward against the left cupola of the diaphragm, and a forced jabbing movement is made behind the ventricular region of the heart, so as to squeeze it effectively against

<sup>1</sup> *British Medical Journal*, 1920, ii, 698.

counterpressure made by the other hand on the precordial region of the chest wall. The compressions are repeated at a rate of about forty a minute (a more rapid rate is not practicable), and are carried on until the heart beat is reestablished with regular rhythm and maximal power as reflected in the pulse. The abdominal wound is then sutured.

If the above fails, he recommends the transdiaphragmatic method as described by Bost<sup>2</sup> and then suggests that if this fails it might be well to expose the heart through an intercostal incision like that of Spangaroo. After retraction of the ribs, the heart, enclosed in its pericardial sac, is grasped and squeezed. I feel, however, that this method is too formidable to meet with much success as an emergency method. Fisher reports 5 cases with recovery in 1. In a second case the patient suddenly ceased breathing, the heart stopped beating, and the pupils dilated widely. Artificial respiration was at once performed and saline was infused. Much time was expended in employing the usual means toward resuscitation, but they all failed, and after about twenty minutes the patient was left as dead.

Without any preparation, Fisher opened the abdomen and after manipulating the heart for about three minutes, the beat returned and the pulse became strong. A septic leg was then amputated and the patient returned to the ward. Death occurred about six hours after the resuscitation. A third case teaches an important lesson. An elderly woman, in a state of collapse, was undergoing operation for strangulated femoral hernia when the heart stopped beating. Cardiac massage was at once performed and spontaneous contractions recurred. As the abdomen was being closed the heart stopped beating again, and a second attempt with cardiac massage then failed. Although the patient was a poor subject, this experience seems to indicate that massage should be carried on until contractions are established at maximal strength, the task not being considered complete merely upon their reappearance.

Fisher discusses the physiology of resuscitation. He states that well before a first heart beat is initiated a change in the appearance of the patient is witnessed, the pallor of the skin gradually being replaced by a perceptible flush. The heart is at first uncertainly palpable in its extreme diastolic flabbiness, but prior to the occurrence of its first contraction, it is felt gradually to become more firm. The first heart beat is minimal, and of the character of a "twisting kick," and the contractions once started, assume regularity and gain strength as the manipulations proceed, until, after some six to twelve contractions, a maximum excursion is reached, which remains constant, at remarkable vigor.

The staircase phenomenon of progressive augmentation is an indication to continue the massage until automatic contractions are well established at maximum vigor, as reflected in the radial pulse.

Asphyxia neonatorum is regarded by Ward<sup>3</sup> as a surgical emergency especially when the asphyxia is the white form with mechanical or imperceptible umbilical pulse. If smacking, clearing the pharynx and artificial respiration have been tried for a minute or so and failed, "the

<sup>2</sup> See *PROGRESSIVE MEDICINE*, March, 1919.

<sup>3</sup> *British Medical Journal*, 1920, i, 255.



child's body is placed flexed and supine. The head and shoulders rest against the upper part of the operator's forearm, and his left hand grasps the infant's left thigh. The fingers of the right hand are now pressed into the upper part of the flaccid abdominal wall beneath the diaphragm, and the right thumb is placed over the cardiac area externally. Massage can now be performed much more effectively than in an adult with the abdomen opened, and is sometimes strikingly successful. Every now and again the operator pauses for a moment to resume artificial respiration, and then begins the massage again if needful."

Tuffier,<sup>4</sup> has massaged the heart to restore the contractions of the muscle in 68 cases. He was successful in 15 cases. These were cases of chloroform poisoning and cardiac syncope due to asphyxia. The pressure should be made upon the ventricles and should be soft, regular, and prolonged. The subdiaphragmatic route of approach has given the best results. Success depends especially on the duration of the syncope, the nature of the operation, and the cause of the accident. Re-animation is more liable to be obtained if the massaging is done during the first ten minutes of syncope. Massive injections of saline or adrenalin solutions into the arteries have been found of value in addition to the massage.

**Intracardial Injections.** Last year I learned for the first time that medication had been introduced directly into the heart and presented a brief report by Zuntz. Recently I looked up the subject, especially as several articles have appeared this year, and am presenting the results of my reading in some detail. According to von den Velden,<sup>5</sup> this method was introduced in 1906 and has become well-established. Vogeler<sup>6</sup> says that intracardial injections constitute the most powerful and the most rapidly effective means of heart stimulation and therefore deserve most serious study not only as to their clinical use but as regards their experimental development.

There is general agreement among those who have had experience with intracardial injections as to the indications for their use. These are concisely stated by Hesse<sup>7</sup> who says that they can succeed only in cases of sudden death due to anesthesia, operative or wound shock, or poisoning, or in individuals suffering from chronic heart insufficiency in whom the strength of the heart has not been driven to its utmost limit by previous treatment by cardiac tonics. Henschen<sup>8</sup> used this method in a case of cessation of heart action as a result of hemorrhage from gastric ulcer.

Szubinsky, as mentioned by Heydloff,<sup>9</sup> says that injections into the heart must be the ultimate refuge in collapse of all kinds and is justified only when a human life may be saved thereby.

The organs, especially the heart itself and the medulla oblongata, with its centers so important to life, must have their circulation reestablished at the earliest possible moment.

<sup>4</sup> Presse méd., 1920, xx-viii, 517.

<sup>5</sup> München. med. Wchnschr., 1919.

<sup>6</sup> Deutsche med. Wchnschr., 1920.

<sup>7</sup> München. med. Wchnschr., 1919.

<sup>8</sup> Schweizer med. Wchnschr., 1920, lx, 261.

<sup>9</sup> Monatsch. f. Geburtsh. u. Gynäk., 1920, li, 318.

Heydloff<sup>10</sup> says, further, that in order that the future results may be more favorable, researches must be made in the large animals. We do not know, as yet, how much damage may be done to the heart muscle by the injection, nor do we know the dosage; whether one or more injections should be given, and in what concentration the medicament should be administered; also whether it is best to make the injection into the heart muscle or one of its cavities.

Von den Velden says that he has utilized the injection of circulatory restoratives directly into the heart in cases in which conditions precluded the introduction of medicaments into a moving blood stream, where even the flow in the jugular vein has ceased, and when at the same time there is ground for the opinion that the heart, if restored, might still be capable of functioning. Under such circumstances, this method of therapy offers the last and only possibility of restoring the heart to action.

There is no indication for the use of intracardial injections in battle-gas poisoning, in death due to various forms of acute and chronic sepsis, very grave wounds, chronic heart disease, or combined heart and kidney disease which have been under treatment for a considerable time.

In addition to the chemical substance which is injected into the blood, it is of great assistance to carry out artificial respiration, oxygen insufflation, and massage of the heart either through the chest wall, or, if during operation which renders it possible, directly to the heart itself through the diaphragm. The object is to excite the heart mechanically, to empty the heart cavities so that they may be filled with fresh blood, to fill the coronary arteries and to raise the blood-pressure in the aorta.

The various medicaments which have been used are camphor in oil, caffeine, digitalis, digipuratum, strophanthin and adrenalin, the latter combined in a few instances with pituitrin. Strophanthin has been found superior to digitalis and its preparations because of its quicker action. However, adrenalin has proved by far the best material for injection and has been used by most observers to the exclusion of others. Recently, von den Velden has used only either adrenalin or strophanthin. The adrenalin acts chiefly by stimulation of the sympathetic nerve endings in the heart muscle, also by action upon the bundle of Tawara and that of His. It is also considered that the influence of the pricking of the heart muscle by the needle used for injection favors excitation of the heart to contraction.

In the majority of cases in which intracardial injections have been used, the patient has, to all appearances, been dead and beyond any promise of human aid, sometimes as much as five or six minutes; usually other measures have at first been tried and the method in question has been adopted as a sort of after-thought.

The technic of the injection varies with different authorities. As described by Zuntz<sup>10</sup> in his case, it consisted in the injection of 1 c.c. of the usual 1 to 1000 adrenalin solution with a moderately long needle into the fourth intercostal space about three fingerbreadths to the left

<sup>10</sup> München, med. Wehnschr., 1919, No. 21.

of the left border of the sternum in an oblique direction medialward. Whether it was placed in the heart muscle or in one of the heart chambers is not known. It may be added that the outcome in this case was favorable. The injection is made by von den Velden in the fourth or fifth intercostal space about two fingerbreadths from the left border of the sternum. He believes that in this way the internal mammary artery is avoided and that the medicament gets into the right ventricle, occasionally the left. Of course, the point selected must depend upon the shape of the thorax, the position of the diaphragm, size and shape of the heart and other thoracic organs. Experiments upon the cadaver with a view to injection into the left ventricle gave uncertain results. As a rule, with an ordinary needle, if the heart is favorably located and the subject is thin and pressure is made on the syringe, the fluid gets into the heart muscle, sometimes only in the pericardial sac or may even be extracardial. Hesse points out that Rüdiger and Szubinsky have made their injections in the fourth, and later, the second or third interspace, at the edge of the sternum. Hesse believes that it is improper to inject into the heart muscle as in such case the distribution of the medicament would be too slow. If injection is made in the fourth or fifth interspace at the sternal border, the fluid will always go into the right ventricle, as in the greatly dilated heart the right ventricular wall is very thin and the fluid is not liable to lodge there. There is no risk of striking the internal mammary artery as at this part of its course it lies 15 to 17 mm. away from the border of the sternum. However, this observer does not believe that the injection should be made into the right ventricle because in that event the fluid would have to traverse the lungs before it could reach the left ventricle. He has, therefore, sought to make the injection directly into the left ventricle. To do this, he selects a point right over the apex impulse or about a finger breadth inside; if this cannot be located, the injection is made inward and upward along the left border of the area of relative cardiac dullness in the fourth or fifth interspace; or, if the heart is much dilated, in the sixth interspace. He used constantly  $\frac{1}{2}$  mg. of strophanthin in 15 to 20 c.c. of normal saline solution. Szubinski used 2 c.c. digipuratum in 10 to 15 drops of 1 to 1000 adrenalin solution. Hesse advises the use of a Record or a Luer syringe of 20 c.c. capacity with a very thin needle 7 cm. long.

The results of intracardial injection as a restorative measure in death from heart failure have not been encouraging. In only a few cases has the patient whose heart action has been revived lived for any considerable time. Since 1906, von den Velden, who has had most experience with this procedure, has resorted to it in 45 cases with positive results in 13, but in no instance did the heart continue to function more than eight hours. A subsequent injection was never of any avail. He is of the opinion that there is an important field for intracardial injections in collapse from anesthesia or operation, although none of these classes of cases were included in his series. Hesse treated in this way cases in which no heart sounds were audible but in which there was still a trace of cardiac action as evidenced by slight movements of the needle when inserted; in 4 of these, the heart action was strengthened, heart sounds



became again perceptible and radial pulse could be felt; but twenty-minutes was the longest any of these patients survived.

Henschen reports 4 patients treated in this manner by the injection of 1 c.c. adrenalin and 0.5 of pituitary substance; of these, one case was successful. This was a man, aged thirty-two years, who was severely injured by compression of the chest and abdomen; to determine the extent of the injury there was done an exploratory operation during which the heart stopped, and, when massage failed to revive it, 1.5 c.c. of adrenalin solution was injected into the pericardium through the fourth left interspace inside the mammillary line; immediately the heart became tense and began to beat strongly and regularly. Then 700 c.c. of saline solution with 10 drops of adrenalin and 5 drops of pituitrin were infused into the arm and recovery was soon complete. Zuntz recites the case of a woman, aged fifty-six years, operated upon for cecal tumor. The patient was very emaciated but the heart and lungs were sound. Soon after reposition of the intestines the breathing became choppy and soon ceased, and a moment later the pulse stopped; the patient grew very pale and no heart sound could be heard. Artificial respiration was started, the tongue drawn out, rhythmic tapping in the heart region was carried out and camphor given subcutaneously without effect. Four or five minutes after the difficulty began and there was no return of heart action, and the pupils were widely dilated, all hope was abandoned. As an ultimate resort the patient was given 1 c.c. of the usual adrenalin solution into the heart in the fourth interspace three fingerbreadths to the left of the left border of the sternum in an oblique direction medialward; whether into the heart muscle or a chamber of the heart is not known. About twenty to thirty seconds after the injection beating in the carotid was seen; one-half minute later spontaneous breathing started. The operation was finished quickly; the wound healed by first intention. Fourteen days later the patient was in good condition.

The case of a boy aged fourteen years is reported by Vogeler. This patient collapsed during operation for obstruction of the ileum. No heart sounds could be heard. There was given 1 c.c. of adrenalin solution directly into the heart. In about one-half minute the pupils began to contract, the pulse became palpable and breathing started. The patient regained consciousness and was able to speak intelligibly. In six minutes the pulse and respiration stopped and the pupils dilated; a second injection of adrenalin revived the boy, but two minutes later he died.

Heydloff recites the case of a rachitic woman, aged twenty-five years, in whom a Cesarean section was done on account of contracted pelvis. As the placenta was being removed, the patient became pulseless; palpation of the heart through the incision showed it to have ceased to beat and that it was in a state of systole. Massage and artificial respiration being without influence, after two or three minutes 2 c.c. of 1 per cent. adrenalin solution was injected into the heart through the fourth interspace close to the sternum. As the patient appeared dead, the closure of the abdominal wound was continued: suddenly, however, the wound

began to bleed and palpation of the heart showed it to be beating again. Artificial respiration and insufflation of oxygen were kept up throughout. The heart had been inactive for five or six minutes. The operation was finished and the patient returned to bed. The course of recovery was uneventful and a month later the patient was discharged fully recovered.

**Pericardiotomy.** Ballance,<sup>11</sup> in his Bradshaw lecture, gives utterance to the thought held by many surgeons that aspiration of the pericardium should be banished from surgical practice. "It is a leap in the dark and many cases of wound of the heart or coronary artery have occurred." This dictum probably will not be accepted by our medical confrères for the reasons given so ably by Matas in his masterly essay in Keen's *Surgery*, but Matas evidently agrees with Ballance as evident by his closing paragraph. There will probably be little exception made to pericarditis as an indication for pericardiotomy but the choice of a limited pericardiotomy for hydrops may be challenged. As Ballance says, however, the operator does not know whether the fluid within the cavity is serous, bloody, or purulent.

Space does not permit an extended discussion of the technic of the operations, and the surgeon, if inexperienced, should study Matas. It will be noted that he refers extensively to the work of a Russian surgeon, Voinitch Sianojentszty. Ballance also refers to this surgeon and pictures his "triangle of safety"—an area which in all cases is uncovered by pleura. Most of the text-books figure the operation of Delorme and Mignon who advocate a vertical incision 1 cm. external to the left border of the sternum, resection of a piece of the fifth and sixth cartilages, detachment of the *triangularis sterni* and displacement outward of muscle, fascia and *internal mammary vessels*, thus exposing the pericardium.

In a splendid paper read before the Academies of Surgery of New York and Philadelphia in December, 1920, Pool showed an operation technic which takes advantage of the above points. He carries his incision downward from the fourth interspace to the seventh cartilage and then outward on the seventh rib. A piece of the fifth, sixth and seventh cartilage is resected and the internal mammary artery *ligated* above and below. The operation otherwise is like the Delorme-Mignon method. He said that he had used the Carrel-Dakin technic in his last case with very satisfactory results.

Ballance, in his long paper, devotes considerable space to the sinus behind the left auricle variously called the cul-de-sac of Haller, the oblique sinus and the bursa of Keith. It extends obliquely upward and toward the right as far as the superior cava. The lower end is widely open below at the level of the groove on the posterior surface of the heart between the left auricle and ventricle. The right border of the opening is on a lower level than the left, and reaches down as far as the inferior vena cava. The opening therefore faces downward, forward, and toward the left.

When fluid distends the pericardial sac, this sac, together with the

<sup>11</sup> Lancet, 1920, i, 1.

large posterolateral pouches and dome-shaped space above are filled. When the pericardium is opened for drainage, the heart, which has been crowded forward by the exudate,<sup>12</sup> sinks down and shuts off the recess behind the left auricle from the rest of the cavity. A study of the reported cases of pericardiotomy for suppurative pericarditis will probably show a number of clinical examples, illustrative of this point. For instance, I note in the earlier paper by Pool and Camac,<sup>13</sup> a quoted case in which, after death, an abscess cavity was found "behind and to the left of the heart, and within the pericardial sac." Ballance quotes the case of Hilsmann in which, during the after-treatment, the patient had to bend over, so that his chest was in the position it would have been if he had been standing on his head, in order to empty the pericardium. This maneuver would also cause the ventricles to move forward, and thus the mouth of the cul-de-sac of Haller would be opened.

In discussing the treatment of cases which do not properly drain through the anterior wound, Ballance makes the following observations: "A tube cannot be introduced into this pouch by passing it under the heart from the right side; it might, indeed, not even lie in the mouth of the sac but remain between the heart and the diaphragm. The same thing is true of any attempt to introduce a tube into the pouch by passing it between the left border of the heart and the inner surface of left lateral wall of the pericardium, because these are in close apposition and drainage would probably be no better than if the tube was carried under the heart, and further, because the operator would be directing the tube backward while the long axis of the pouch is in the vertical direction."

In Ballance's opinion, the only satisfactory way of draining the pouch of Haller is by making an opening in the left lateral wall of the pericardium opposite the mouth of the pouch. In order to do this, there are obvious advantages in the adoption of the Spangaro operation.

In most cases, the tube will lie inside the pleura in its course to the surface and should be packed round with gauze, but, if the pleura and lung are not wounded, it might be possible to strip back the pleura and push back the lung from the lateral boundary of the pericardium, making the incision in the proper place in the pericardium without opening the pleura.

**Foreign Bodies.** Many articles on the removal of projectiles from the heart continue to appear, especially in the French literature. Many writers concern themselves with the method of exposure and I take it

<sup>12</sup> An interesting and instructive study has been published by Williamson. *Arch. Int. Med.*, 1920, xxv, 260. He has arrived at the definite conclusion that the fluid accumulates first along the lower margin of the heart and about the apex, particularly on the diaphragmatic surface of the heart. With small effusions, this is the only place in which fluid accumulates with regularity. The result of the accumulation of the fluid in this position is to push down the left lobe of the liver. This feature is said to be sufficiently conspicuous to serve as an early diagnostic sign of effusion. The second place in which fluid accumulates, Williamson continues, is over the great vessels at the base. With small effusions it is occasionally present in sufficient amount to be detected by percussion. With medium-sized effusions this layer is generally thick enough to be demonstrable by percussion, and this retrosternal dullness is an important diagnostic sign.

<sup>13</sup> *American Journal of the Medical Sciences*, 1917, cxliii, 409.



that most surgeons in this country prefer the Kocher chondroplastic flap or the modification of Delorme-Mignon in which the cartilages are removed. The latter is preferable, as no dead space is left under the flap at the close of the operation. In 1906, Spangaro advocated a simple intercostal incision which is practically the same as the one used by Duval and others in the operations on the lung. I notice that in a recent case, Luckett<sup>14</sup> removed a bullet from the heart by means of an incision in the sixth intercostal space, the wound being held open by a Tuffier rib spreader (see Fig. 24). It seems to me that there is no reason why this simple intercostal incision should not be the method of choice in all cases of injury to the heart. By cutting the rib upward and downward

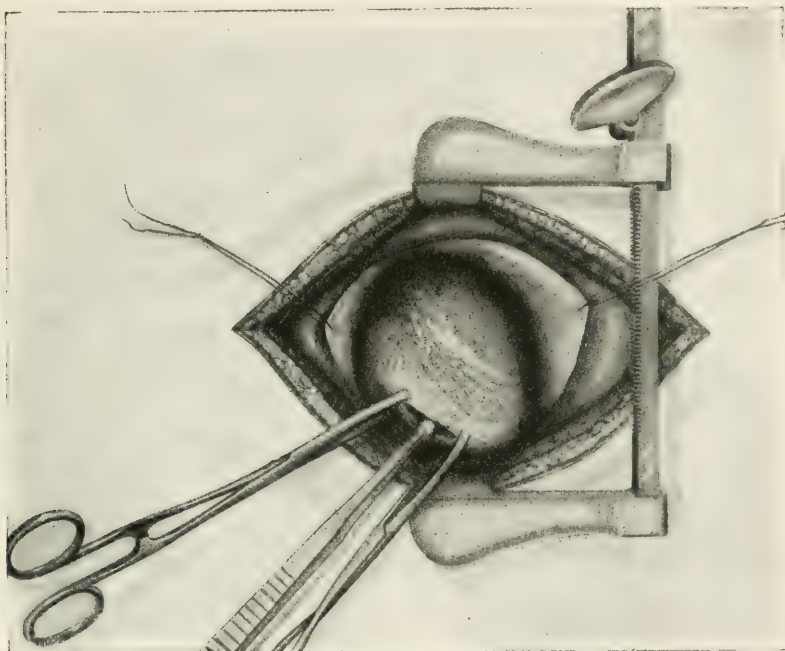


FIG. 24.—Intercostal wound held open by Tuffier rib spreader. Pericardial wound held open by linen traction sutures.

at the sternal end, a large area can be exposed. I do not intend to go into the matter of heart wounds this year. One point may be mentioned: Tuffier<sup>15</sup> stating that the incision of the heart for the removal of a foreign body or the treatment of an endocardial lesion must not be made in any of the danger zones. Such zones are those near the bundle of His, the interauricular septum, and the large coronary vessels, including the coronary artery from its origin to its bifurcation. Section here is fatal, but the branches of the coronary artery may be tied off with impunity. To extract a foreign body the heart should be taken in the palm of the hand and the region to be incised should be limited by two fingers. The

<sup>14</sup> Surgery, Gynecology and Obstetrics, 1920, xxxi, 417.

<sup>15</sup> Presse méd., 1920, xxviii, 517.

possible complications of this procedure are cardiac syncope and hemorrhage.

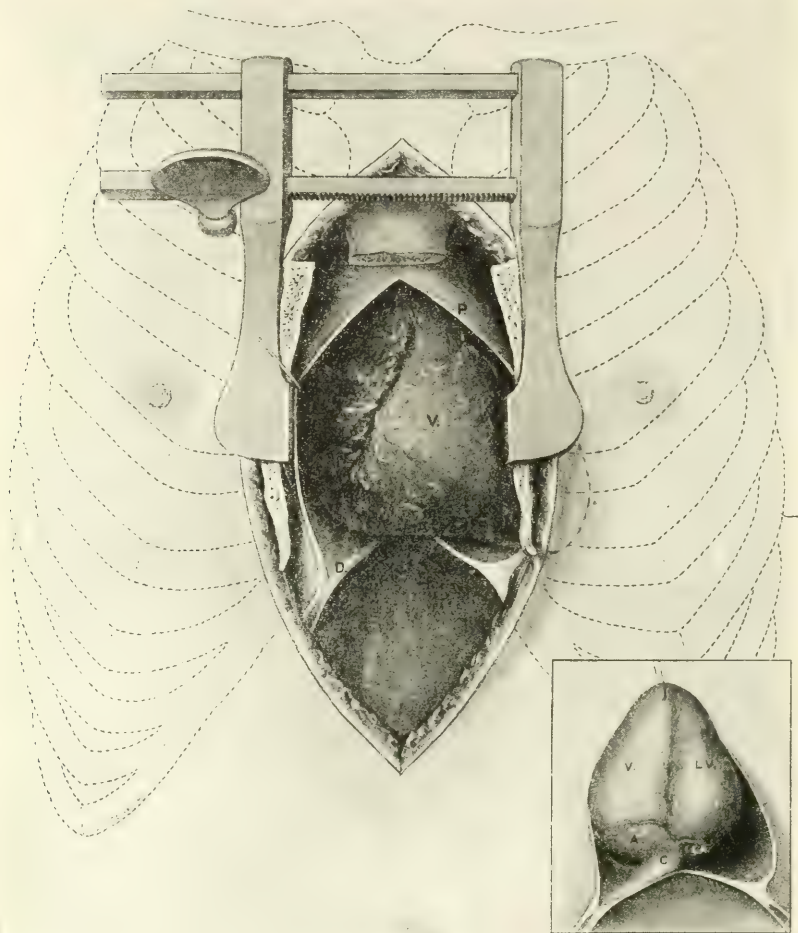


FIG. 25.—The Duval-Barasty median thoracotomy. *P*, cut edge of pericardium; *D*, cut edge of diaphragm; *A*, right auricle; *V*, right ventricle.

In this case the halves of the sternum were drawn apart for a space of 3 inches. During this maneuver they and the attached cartilages moved forward as well as outward. The retractor has to be very powerful.

Small Inset drawing on the right.

*V*, right ventricle; *LV*, left ventricle; *A*, right auricle; *LA*, left auricle; *C*, inferior vena cava extending from diaphragm to right auricle.

A suture has been passed through the apex of the heart and by it the organ has been drawn forward and upward. In this way the whole posterior surface of the heart is exposed.

**Cardiolysis.** Tuffier touches on this subject and refers to cases of bilateral pericardial pleural adhesions with concomitant and consecutive

asystole. Rehn<sup>16</sup> reports some very unusual cases of adhesive pericarditis in children, in which he slit the sternum slanting from the right lower side to the upper left side in the second or third interspace. The pericardium was then slit to correspond, and in three of the cases he was able, by this means, to break up the adhesions between the sheets of the pericardium, but in the fourth case this was not possible. Then a large portion of the anterior wall of the pericardium was resected, and the gap was covered with a fat fascia flap. All of the cases recovered well from the operation, but died soon after from various diseases. Tuffier also refers to the resection of the pericardium, and advises it. Delorme<sup>17</sup> reserves the term *cardiolysis* to the separation of the adhesions between the visceral and parietal layers of the pericardium. The decompression produced by removing the overlying rib is termed by him *pericardiolysis*. Much should be made of the extensive Duval-Barast operation recommended in 1918 by these French surgeons. The sternum is cut through transversely opposite the third cartilage and from this point downward is split longitudinally. The accompanying illustration (see Fig. 25) from Ballance's book dissects the exposure. I should think the method would be quite applicable to cases of *cardiolysis* or where exposure of the great vessels at the base of the heart was desired, but the operation would appear to demand an excellent general condition of the patient.

**Rupture of the Heart.** Although of no practical surgical importance, the cases recounted by Howat<sup>18</sup> are most interesting. He states "that cases of cardiac rupture are commonly divided into two classes, spontaneous and traumatic. The former occur from within because a local weakness of the heart's wall renders it there unable to withstand the pressure of the contained blood. Such local weakness is most commonly the result of disease, and its favorite seat is the left ventricle. Spontaneous rupture of the entire thickness of the heart's wall is rapidly, and doubtless, invariably, fatal, because the shed blood, accumulating within the intact pericardium, quickly embarrasses the heart's action to the point of stoppage, and because it is practically impossible to diagnose and so directly combat the condition in the short time available."

In the first case reported, the patient fell 45 feet, and, in addition to rupture of the kidney and liver, sustained a slit-like opening in the wall of the left auricle, the pericardial sac being full of blood. In the second case, communicated to Howat by Donaldson, the patient was compressed between pipes. He remained in bed for two weeks and resumed work after three weeks. His pulse-rate showed no departure from the normal, and his general condition called for no special remark or anxiety. After three days' resumption of work, he felt unable to continue, his chief complaint being pain in the chest. He was confined to bed again for two weeks, during which his pulse-rate rose gradually from 30 to 60. He appeared to be progressing favorably, when he suddenly died. A postmortem examination revealed no injury of any part of the chest

<sup>16</sup> Arch. f. Kinder Heilk., 1920, lxxviii, 179.

<sup>17</sup> Gaz. d. Hôp., 1919.

<sup>18</sup> Lancet, 1920, i, 1313.



wall, except the scraping of the skin. The pericardium was intact and full of blood. No disease of any part of the heart substance was found. The left ventricle alone was injured. Its wall was bruised in five places, three in front and two behind. The largest bruise, the size of a shilling and extending through the greater part of the wall's thickness, was in front near the apex. Here the ventricle wall was ruptured.

### THE LUNGS AND PLEURA.

**Chest Wounds.** The literary output on war wounds of the chest continues to be large in quantity. I think, however, that it will be best to limit our range to a few papers serving a special purpose. A statistical report issued recently by the Medical Research Committee, in which some of the surgical results obtained in France are collated and summarized, is of more than passing value, for, in addition to the statistics there tabulated and now made available for general reference, indications for surgical interference are clearly enunciated and the limitations of active treatment are defined. The first section of the report deals with statistics of 600 cases furnished by Major W. L. Mann, C. A. M. C., and is of great value because he personally treated each case and followed it up from the records of the base and home hospitals. The results he obtained were strikingly good, and may be accepted as indicating a standard of what sound judgement and skilled surgery in combination can effect. The second section deals with a large series of cases which occurred in the autumn fighting of 1917, on the Passchendaele Ridge. The investigation was undertaken to determine the total mortality from chest wounds and to ascertain statistically the result of operation as contrasted with expectant treatment. The third section deals with a series of tables compiled at the bases by Colonel Pasteur and Colonel Elliott during the autumn of 1918, when the condition of warfare had altered from close to open fighting, and the fourth section contains tables comparing the results in 1916, 1917, and 1918. The report is filled with statistical tables and deductions therefrom, but there is nothing very different from that which I have presented in these columns each March since 1917. We might quote the last paragraph "The figures show that with the average skill available among general military surgeons, nearly 30 per cent. of thoracotomies developed sepsis later, and had to be drained for empyema. The general incidence of empyemata was not markedly reduced by early operations, and the great value of the new surgical procedure was seen to lie chiefly in its power to save from death men with wounds of such severity that, apart from early operation, they would unquestionably have died outright or succumbed later to an overwhelming infection of the pleura."

The various papers on the physical signs of gunshot wounds of the chest by Sir John Rose Bradford<sup>19</sup> have been by far the most informative on the subject, and his latest is no exception. It mostly deals with "massive collapse" of the lung.

<sup>19</sup> *Lancet*, 1920, ii, 636.

His discussion of the hemothorax produced by simple penetrating wounds limited to the side should be carefully read by all surgeons because such will be the injury encountered in civil practice. The signs, as given by Bradford, are as follows: The affected side of the chest is immobile and retracted to a greater or less degree, and, notwithstanding the existence of this retraction, the heart is displaced in a manner similar to that seen in pleural effusion, *i. e.*, away from the retracted and affected side and toward the normal side. Well-marked retraction may be present when the hemothorax is by no means small in amount, *i. e.*, two to three pints. The retraction is not only obvious to the eye and capable of being measured by the cyrtometer, but is shown in another way, *i. e.*, by the upward displacement of the diaphragm, which is a most constant and characteristic feature of cases of hemothorax. This upward displacement of the diaphragm is readily detected on *x-ray* examination, but in cases of left-sided hemothorax it can also be determined by the increased area over which resonance can be elicited by percussion, and Traube's space, instead of being diminished in area as determined by percussion, is, on the contrary, greatly increased in the upward direction. The important feature, therefore, of hemothorax, is that both the chest wall and the diaphragm assume a position *diminishing the size* of the pleural cavity on the injured side and they both become immobile. The auscultatory physical signs of hemothorax are also somewhat different to those commonly present in pleural effusion, in that tubular, and even amphoric, breathing are much more frequently heard, together with greatly increased bronchophony and extremely well-marked pectoriloquy. Bradford believes that in simple penetrating wounds causing sterile hemothorax the collapse of the lung was not directly and solely dependent upon the quantity of the extravasated blood and fluid in the injured pleural cavity. He then turns his attention to the group of non-penetrating unilateral wounds and the phenomena produced therefrom, particularly contralateral massive collapse. The physical signs and diagnostic features are minutely described, and then, in conclusion, Bradford states that not only is massive collapse a very common, perhaps the most common, result of a gunshot wound of the chest but he is of opinion that this is the reason why the physical signs of a simple sterile hemothorax are often different from those of a pleural effusion. In the latter, the collapse of the lung is produced gradually in association with the pleural exudate; in the former, massive collapse of greater or less extent is produced more or less suddenly, and the hemorrhagic effusion of the hemothorax is only in part responsible for the collapse of the lung present.

**Retained Projectiles.** The fate of patients with retained projectiles in the chest has been the subject of a good deal of speculating and there is much conflicting opinion as to the wisdom of subjecting them to operation. If everyone was as skilful as Petit de la Villeon, the answer would be simple. Moynihan,<sup>20</sup> in the Hunterian Lecture for 1920, considers this topic and reports the results of 49 cases with operation. Moynihan

<sup>20</sup> British Journal of Surgery, 1920, vii, 445.

considers the indication for operation to be: (1) *The continued presence of subjective symptoms.* Pain, dyspnea, cough, chilliness and palpitation were the principal symptoms complained of, and in a few cases there were complaints of digestive discomforts, pain and flatulence after food, eructations chiefly due to air-swallowing and constipation. He makes the important point that it is not so much the mere presence of a foreign body in the lung that should be considered, but rather the various changes in the lung and in the pleura which result from the original injury, and which are chiefly the cause of symptoms and chiefly in need of relief. (2) *The condition of the foreign body and of the lung surrounding it.* Infection, sclerosis, "hepatization," around the foreign body. In 2 cases bronchiectasis was present. (3) *The condition of the pleural cavity.* The sinking-in of the chest wall, the collapse of the lung, and the pulling over of the whole mediastinum, are results of the pleural injury and the pathological conditions subsequently developed and are causes of the respiratory and other difficulties of which an account is given elsewhere. The crippling effect of adhesions leads us to compare the methods of Petit de la Villeon, and the open method. In the former, nothing is done to alter the physical conditions within the chest cavity other than the removal of the foreign body. In the latter, all adhesions are separated, masses of lymph dissected off the lung and the diaphragm, and a considerable attempt made to cause a return of the conditions to the normal.

Moynihan traced 41 of the operated cases, and found that 24 (58.5 per cent.) stated that they were in perfect health and able to do heavy work; 14 (34.1 per cent.) are improved, but still have some shortness of breath, or unusual respiratory trouble when having a cold, or in bad weather. Moynihan gives some description of the pathology. Empyema after operation developed in 5 cases, and in each of these, when the foreign body was examined, it was found to be infected. In 12 cases blood collected after operation in sufficient quantity to require aspiration. In all these the adhesions were dense, and were widely separated. These 12 include the 5 reported above which subsequently developed empyema. Of the 7 which did not suppurate, only once was the foreign body examined, and it was sterile.

In 10 cases the original injury had been followed by empyema. The only effect this had at the time of removing the foreign body was that adhesions were found to be very dense and extensive. Three cases were reported as having had hemothorax at the time of the original injury; at the operation for removing the foreign body, adhesions were dense; in 2 of these 3 cases an exceedingly thick blanket-like membrane had to be removed by scissors to allow the expansion of the lung. Moynihan prefers the operation of Duval, a method fully described and commented on in these columns since 1917. His comment upon the technic of operations at the root of the lung and upon the mediastinum is brief but practical. He does not think that the flap operation of LeFort is necessary, it is more formidable, inflicts greater damage on the chest, and implies a more protracted convalescence, and perhaps a weaker chest wall in days to come.



ROENTGEN LOCALIZATION. I think it worth while to include the note made by Saargill for Moynihan's paper because it so succinctly describes the roentgen findings. The examination resolves itself into three parts:

1. The localization of the foreign body should be as accurate as possible. It is advisable to mark the position of the foreign body on both anterior and posterior surfaces, and to indicate the distance of the foreign body from each.

The radiograph should always be taken from the surface nearer to the foreign body. The depth from the surface can be ascertained by any of the usual methods. It is advisable to make observations from the anterior and posterior surfaces as a means of checking the result obtained.

2. The screen examination of the chest. If the metal moves downward on deep inspiration, it must be in the lung, or embedded in the diaphragm.

If in the root of the lung the movement is downward, but is very slight indeed.

If the movement is upward on inspiration, the metal is either (a) in the chest wall, or (b) in a portion of the lung which is firmly adherent to the chest wall and can only move with the chest wall.

3. The examination for adhesions of the lung and chest wall. In the lower part of the chest, the movement of the arch of the diaphragm on the affected side is most important as an indication of the degree of expansion of the lung.

Around a part of the lung which is adherent to the chest wall there is generally patchy opacity to be seen, due to thickening of the pleura. In some cases the lung and pleura may appear quite translucent, and yet at operation there may be found very firm adhesions.

Adhesions can only be seen as opacities when there is thickening of the pleura of long standing.

METHOD OF PETIT DE LA VILLEON. In *PROGRESSIVE MEDICINE*, March, 1918 (p. 114), I first presented this method. It was referred to in 1919, and last year I devoted several pages to the technical procedures. In his latest paper the results in 336 cases are tabulated. There were three deaths—a mortality of 0.89 per cent. These operations were as follows:

1. Intrapulmonary projectiles, extracted through buttonhole incision, under the fluoroscope, at a depth varying from 1 to 13 cm. in the parenchyma, 155; deaths, 3.

2. Projectiles in the hilum-hilum method, 17; deaths, 0.

3. Projectiles in the pleura, extracts through a button-hole incision by means of forceps, under the fluoroscope, 48; deaths, 0.

4. Projectiles in the diaphragm, various methods, 16; deaths, 0.

Villeon announces the principle that: A blunt instrument slowly introduced into the lung parenchyma, living and healthy, causes no damage, provided that it follows a single tract, and does not penetrate the region of the hilus. This is the fundamental law on which the method is based, a physiological law never before formulated, and possible disputed, but which he believes may be accepted as true. On account of the elastic and resilient consistency of the living and healthy pulmonary

parenchyma, the bloodvessels and bronchial structures, which are not attached to anything, nor obstructed by anything, are turned aside by the blunt end of the instrument, and the forceps passes by them. One of the most interesting sections of his report is that devoted to projectiles in the region of the hilus. He defines this as: "A scapulovertebra trapezium limited internally by the spine, externally by the vertebra border of the scapula in its lower half, above by the fifth rib, below by the eighth rib." In this region the extraction of the missile by the forceps is contra-indicated. In 17 cases he extracted the foreign body by means of a posterior rib resection (sixth, seventh and eighth) aided by the total pneumothorax. He prefers a deep tampon to lung suture because, if hemorrhage occurs in the sutured lung, the bleeding continues unchecked *via* the bronchi.

**Surgical Treatment of Tuberculosis.** But little emphasis has been laid on this method of treatment owing to the rich literature on war wounds, empyema, etc. Few physicians are aware of the achievements of surgery in the treatment of tuberculosis and I intend to bring out and emphasize more fully each year the possibilities of certain operations in the cure of patients having advanced but unilateral lesions in the lung. For the present it will suffice to offer a short general review of some recent literature. One of the pioneers in England, perhaps the only one, is Davies<sup>21</sup> whose brilliant book has been recently published. In the chapter on Tuberculosis, he states that the objects of modern surgical treatment are:

- (a) The immobilization of the diseased lung.
- (b) The abolition of the mechanical disabilities produced by the pull of the contracting fibrous tissue on the mediastinum, on the diaphragm and on the chest wall, and also on the walls of the bronchi.
- (c) The obliteration of abnormal cavities and of the abnormally dilated existing spaces (bronchi) by the approximation of their walls.
- (d) The diminution, by the changes in the cavities just referred to, of the secondary infections and the prevention of retention of secretions.
- (e) The prevention or the arrest of hemorrhage.
- (f) As a result of the above changes, the immediate diminution or even the abolition of the main symptoms of the disease. Of these, the diminution in the cough, and the pyrexia due to pyogenic infection are the most gratifying, as these symptoms contribute so greatly to the state of ill-health from which some patients suffer.

There are four methods by which collapse of the lung may be obtained:

1. Nitrogen displacement (artificial pneumothorax).
2. Rib mobilization (Wilms' operation, modified).
3. Local replacement by tumors or foreign bodies.
4. Partial collapse of the lower lobe by paralyzing the diaphragm (section of the phrenic nerve).

**NITROGEN DISPLACEMENT.** But little need be said here regarding this method because it is more particularly a subject for my colleague Dr. Pepper, to discuss. A voluminous literature has arisen, and rather

<sup>21</sup> Surgery of the Lung and Pleura, 1919.

recently a long article by Peters<sup>22</sup> appeared and is quite accessible. The method seems to be familiar to those who see and treat large numbers of cases of pulmonary tuberculosis, but my observations would lead me to believe that the average practitioner is ignorant of its advantage and brilliant results in certain cases. Armstrong<sup>23</sup> urges that in every town of over 10,000 inhabitants, the physician should familiarize himself with this plan of treatment. Saugman<sup>24</sup> reports on a twelve-years' experience and a material consisting of over 400 pneumothorax-treated patients. He presents an analysis, with many tables, of the results in 257 third-stage cases. In 172, the operation succeeded, and, of these, 32 per cent. were well and able to do general or light work; 63.4 per cent. died from the tuberculosis. Of 85 patients in whom the operation was a failure technically, only 10.9 per cent. were able to work, and 83.5 per cent. were dead from tuberculosis. In one interesting table he compares the cases with and without effusion following the injection. The results of the two series is practically identical with a slight preponderance in favor of the dry pneumothorax cases. Rivers<sup>25</sup> believes that the effusion is favored by exposure to cold as in patients being treated in outdoor sleeping shelters. He believes that its occurrence is an indication for thoracoplasty.

THORACOPLASTY. In December, 1907, Friedrich performed his first thoracoplasty for tuberculosis and this served as the starting-point for a numerous series of operations chiefly by Friedrich, Brauer, Sauerbruch and Wilms. In 1911, Friedrich was able to report 28 cases operated upon, with 19 recoveries. The latest results of Sauerbruch's work published by Henschel showed that of a total of 122, 24 were cured, 30 considerably improved, 32 improved, and 4 unchanged or worse. Bull,<sup>26</sup> of Christiana, writes that he has performed 48 operations in all and refers to 88 cases performed by three other Scandinavian surgeons. Eleven of his cases were operated on in 1919. He analyzes the results in the remainder. There were four deaths. Of the 33 patients who survived the operation, 7 succumbed to tuberculosis and one to influenzal pneumonia. Of the 25 who were still alive, 11 were fit for work, were always afebrile, and their sputum no longer contained tubercle bacilli. Seven others still suffered from active tuberculosis. The remaining seven had been operated on within a year, and no permanent result could be claimed, though there was every prospect of a permanent cure in several of these cases.

Willy Meyer,<sup>27</sup> whose work in thoracic surgery has been, in this country, of the pioneer variety, reports his first case with a very successful result. He operated under local anesthesia (Figs. 26 and 27) and resected the ribs in two sittings after the method of Sauerbruch. I notice that he regretted having to reopen the healed scar of the first operation and "suggested the thought of trying to do the required resection in one stage in the future, at least in patients not too greatly reduced." But

<sup>22</sup> New York Medical Journal, 1919, cix, 585.

<sup>23</sup> Pennsylvania Medical Journal, 1920, xxiii, 315.

<sup>24</sup> Lancet, 1920, ii, 685.

<sup>25</sup> Ibid., p. 244.

<sup>26</sup> Ibid., p. 778.

<sup>27</sup> Surgery, Gynecology and Obstetrics, 1920, xxx, 161.



Bull notes that he reduced his mortality of 30 per cent. to 4 per cent. by operating in two stages. He also employs Sauerbruch's hook-shaped

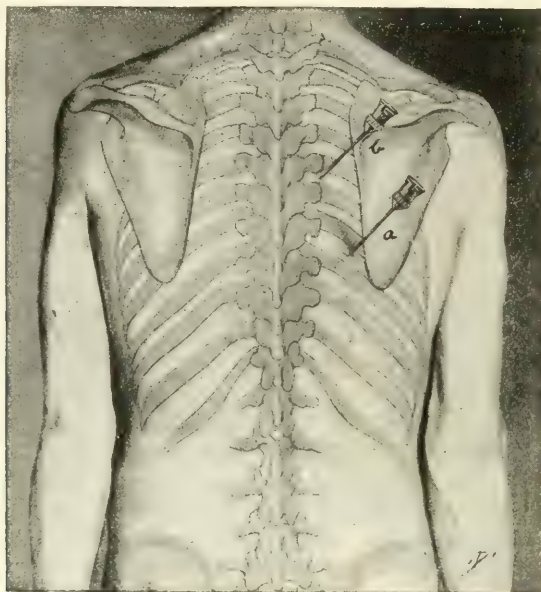


FIG. 26.—Diagrammatic illustration of the location where the needle is introduced in Schumacher's, *a*, and Kappis', *b*, methods. In practice the needle at *a* has to point upward and inward and run close to the rib.



FIG. 27.—The same with the patient in the abdominal posture, lying horizontally on the operating table. (In the picture the table has been tilted in order to allow the artist to photograph the entrance of the needle in the back.)

incision and operates, at least during the first stage, under local anesthesia injecting each intercostal nerve. In doing so it must be remembered that the intercostal nerve behind the angles of the ribs does not

lie quite beneath the edge of the rib, but in the intercostal space between the external intercostal muscles on one side and the endothoracic fascia and the costal pleura on the other; for the internal intercostal muscles only begin at the angle of the rib. For the above anesthesia 200 to 300 c.c. 0.5 per cent. and 50 to 75 c.c. 1 per cent. novocaine may be used.

On the day of the operation the patient must cough as much as he can in the morning so as to clear the lungs of expectoration, so that there is no risk during the operation of an attack of coughing coming on, which could be dangerous, due to the aspiration of sputum in one lung or the other. The position during operation renders expectoration difficult. He resects from the eleventh to the fifth ribs at the first stage and at the second, the remaining ribs including the first. The two upper ribs are not so easily removed. This part of the operation can be considerably facilitated if, after resection of the fourth or third rib, we carefully cut through the periosteum and the endothoracic fascia, and then undertake a loosening of the apex of the lung, or regular apicolysis. The lung is thus removed from the ribs, and therefore no risk is run of its lesion during resection of the second and first ribs; in addition, the apicolysis contributes *per se* toward further collapse of the lung. I notice that both Meyer and Bull drained their cases but removed the drains on the third and second days respectively. Rib mobilization is also considered by Davies but he prefers a modification of the Wilms' method.

LOCAL REPLACEMENT BY FOREIGN BODIES. Two types of foreign substances have been used: (1) Paraffin or parts which have paraffin as a basis; (2) transplanted living tissue, such as fat. Although Sauerbruch has used the former in many cases, it does not seem as satisfactory as the latter method advocated by Tuffier. Bull has performed 9 intrathoracic fat transplantations with 5 successes, the 4 failures being due to infection. He states that the indication is furnished by the presence of a cavity in the apex in which the momentary effect of thoracoplasty is often strikingly good, but sooner or later profuse expectoration and subfebrile periods may again appear, and the physical signs of a cavity again become more pronounced. He resects 6 to 8 cases of the third or fourth rib in front, whereby we usually meet with the foremost resection incision from the previous operation. One cuts carefully through the periosteum and endothoracic fascia, thus reaching the correct layer for apicolysis, *viz.*, between the parietal pleura and endothoracic fascia. If we should happen to work in between the two layers of the pleura, this would scarcely be of any practical importance. The danger of opening tuberculous foci is, perhaps, a little greater. If in the right layer, the loosening of the apex itself proceeds very easily. Continue to loosen as far upward as to the first rib and one has then made a cavity the size of a hen's egg or a medium-sized potato. The cavity can be enlarged without difficulty, but it is not advisable, as it is hard to procure a patch of fat sufficiently large to fill it up. The piece of fat should not be too thick. There is no bleeding worth mentioning, but, in order to stop all oozing, tampon the cavity and cover the whole wound carefully with sterile gauze. The fat is taken from the abdomen and in general

the size of the piece varies from that of the palm to that of the entire hand. It is then placed smoothly in the cavity or if too large is doubled over.

**SECTION OF THE PHRENIC NERVE.** Davies advocates this operation to limit the expansion of the basal part of the lung and so check the aspiration of pus and the extension of the disease into the lower lobe. It also abolishes the cough reflex set up by adhesions between the base of the lung and the diaphragm. He also considers it as a distinct means for the treatment of the disease:

1. In the rare cases in which tuberculosis invades primarily or mainly the lower part of the lung, the immobility or the diminution of movement and the partial collapse of the base of the organ produced by paralysis of the diaphragm will have a beneficial influence in placing the granulomata under conditions favorable to their success and in overcoming the local mechanical disabilities.

2. The success of nitrogen displacement is at times interfered with by the fusion of the diaphragmatic surfaces of the visceral and parietal layers of the pleura. This fusion will limit the degree of collapse obtainable partly by reason of the fixation of the lung and partly because of the symptoms which result from the drag on the muscle by the displaced lung. Paralysis of the diaphragm will allow of a considerable further collapse of the lung and will prevent the development of the symptoms due to the pull on that muscle.

3. In certain cases of chronic fibroid phthisis in which there are few, if any, signs of activity, but in which the symptoms due to distortion and dilatation of the bronchi are progressive, the change in the mechanical conditions which will result from paralysis of the diaphragm will check the increase in these symptoms and may even diminish them.

This operation is easily done under local analgesia, the tissues being infiltrated with 2 per cent. novocaine and adrenalin one hour previously, and, in addition,  $\frac{1}{3}$  grain of morphine given in nervous patients fifteen minutes before the operation. The nerve is found by making an incision  $1\frac{1}{2}$  inches in length along the outer border of the lower end of the sternomastoid muscle. This muscle is retracted inward, the scalenus anticus is exposed and the nerve will be found running along the anterior surface of the muscle near its inner margin. The nerve is cut with scissors, the divided ends being left in apposition and the cutaneous wound is closed.

**ABSCESS OF THE LUNG.** In 1917,<sup>28</sup> I abstracted a group of papers bearing on the etiology of this disease. A number of cases were reported following tonsillectomy, and Manges believed abscess could occur from (1) anesthesia; (2) aspiration of infected blood or of pieces of tonsillar tissue; (3) embolism or infection of the lung; (4) some special infective agent; (5) some antecedent cause, either local or general.

Clendening,<sup>29</sup> after reporting a case, believes that motor-driven anesthesia apparatus used in tonsil operations may be responsible for the inspiration of septic material and the resulting lung abscess. He

<sup>28</sup> *PROGRESSIVE MEDICINE*, March, 1917, p. 114.

<sup>29</sup> *Journal of the American Medical Association*, 1920, lxxiv, 941.



also makes the suggestion "that there is a relation between the tonsil and the lung which has not been dwelt on sufficiently." He believes there is a pathway from the tonsil to the lung and that "the description of lymphatic drainage of the tonsils in the standard text-books on anatomy are very vague on the lymphatic chain after it reaches the deep cervical." Perhaps Poirier and Cuneo's book would enlighten him.

Simpson and Noah<sup>30</sup> object to the "arrogant stand" taken by some who deny the possibility of the hematogenous origin of abscess after tonsillectomy. Hedbloom,<sup>31</sup> after quoting Coakley, "that the infection is not embolic" add that "the fact that following approximately 16,275 tonsillectomies performed at the Mayo Clinic there has not been a single contention." In another paper, Hedbloom<sup>32</sup> reports 45 proved cases collected from the literature, and adds 7 from the Mayo Clinic wherein the pulmonary abscess followed dental operations or trauma. In the first paper, Hedbloom groups his 56 cases of pulmonary suppuration observed at the Mayo Clinic, as follows:

TABLE 3.—ETIOLOGIC FACTORS.

	Cases.	Acute abscess.	Chronic abscess.	Bronchiectasis.
Primary abscess:				
Pneumonia . . . . .	13	7	4	2
Tonsillectomy . . . . .	5	3	2	
Empyema . . . . .	4	..	2	2
Extraction of teeth . . . . .	6	5	1	
Grippe . . . . .	2	..	1	1
Foreign body . . . . .	1	..	1	
Dust . . . . .	1	1		
Trauma plus pneumonia . . . . .	1	1		
Hepatic abscess . . . . .	1	..	1	
Subdiaphragmatic abscess . . . . .	1	1		
Abscess after operations:				
Cancer of stomach . . . . .	1	1		
Gastric ulcer . . . . .	2	2		
Duodenal ulcer . . . . .	1	1		
Appendicitis . . . . .	1	..	1	
Questionable . . . . .	14	8	4	2
Primary abscess not operated on:				
Tonsillectomy . . . . .	1	1		
Pneumonia . . . . .	1	..	1	
	56	31	18	7

The question of nomenclature in pulmonary suppuration has often been vexatious, and Hedbloom solves it by grouping localized bronchiectasis with abscess and gangrene. Davies<sup>33</sup> includes all cases of acute suppuration in the lung parenchyma under the term "chronic abscess." Hartwell<sup>34</sup> does not include bronchiectasis, but otherwise is in accord with Davies. He says: "Abscess of the lung means a collection of pus within the destroyed lung parenchyma that is, it must be outside the lumen of the respiratory tree. Dilatation of the bronchi with a purulent

<sup>30</sup> Pennsylvania Medical Journal, 1920, p. 322.

<sup>31</sup> Medical Record, 1919, xlv, 441.

<sup>32</sup> Annals of Surgery, 1920, lxxi, p. 568.

<sup>33</sup> Surgery of the Lung and Pleura, London, 1919.

<sup>34</sup> Annals of Surgery, 1920, lxxii, 333.

inflammation of the mucosa and an excessive expectoration of foul sputum is not to be confused with abscess. This lesion—bronchiectasis—may coincidentally be present, but is not necessarily so. Surrounding the abscess—really a portion of its wall—there often exists a destruction of lung tissue which may be somewhat massive and approach gangrene. One must, to a certain extent, be empiric in delimiting this lesion from a true gangrene. When the condition has resulted from bacterial invasion, *via* the respiratory tract, and is early manifest by the suppurative process, the term gangrenous abscess is accurately descriptive. Gangrene should be reserved for a massive destruction of lung tissue, either from true circulatory disturbance, or from such an overwhelmingly virulent infection that the lung tissue is killed in mass by toxins or vascular plugging before there can be a sufficient reaction to general pus. If this division be followed, the number of cases of lung gangrene reported will be materially lessened, and a better understanding of the pathological processes be possible.”

These three articles will well repay careful reading but space forbids extended discussion here. I note that Hedbloom found in 33 per cent. of his cases, a syndrome suggesting phthisis. Hartwell concludes “that the pneumococcus is not an important factor in lung abscess; that the staphylococcus aureus is often responsible; that abscess of the lung frequently is a primary lesion in that a true pneumonic consolidation, as connoted by the name pneumonia, does not precede it; that abscess of the lung includes in its pathology a marked degree of surrounding necrosis, or even massive gangrene, and that when an empyema ruptures into the lung and discharges through the bronchus the original lesion was a lung abscess which, by its extension, finally found two outlets for its purulent content.”

TREATMENT. Thoracotomy, with rib resection and pneumonotomy, is the standard operation. The lung must be securely anchored to the abdominal wall by adhesions or by suture. Hedbloom follows the standard procedure and believes that unless immediate drainage is indicated, it is therefore safer to wait a few days before attempting to drain the abscess. He follows up the aspiratory needle with cautery incision, burning a funnel-shaped path to the abscess. Whittemore<sup>35</sup> also waits for two or three days for adhesions to form. He does not use the cautery, preferring to cut into the lung for about three-fourths of an inch with a knife and then explored the lung with his finger. The finger can readily tell when the abscess is broken into, whether or not there is actual pus to prove it. But Davies does not wait. He thinks that the delay of the forty-eight hours between the two may be very serious to the patient, and the necessity of two operations, and possibly two anesthetics, is detrimental for both physical and psychical reasons. By correct suturing of the pleural membranes, it is possible to avoid the danger of infecting the pleural cavity. He also objects to the cautery because it is quite incapable of controlling the hemorrhage from the larger vessels. By charring the surface, it interferes with the recognition

<sup>35</sup> Surgery, Gynecology and Obstetrics, 1920, xxxi, 144.

of the tissues which are being divided and may therefore penetrate a large vessel or a bronchus which could and should have been avoided. There seems to be a wide variation in the mortality of this operation because in the 47 cases of acute and chronic abscess in the Mayo Clinic the mortality was about 40 per cent., whereas Whittemore reports 17 cases with only a 6 per cent. mortality.

NEOARSPHENAMIN IN GANGRENE OF THE LUNGS. Several writers have again brought up the use of neoarsphenamin in this affection. Reichmann<sup>36</sup> gave a patient 0.6 gm. intravenously. Eight days later expectoration ceased and cough was slight. The general condition improved markedly. Becker<sup>37</sup> found this drug successful in 2 cases of fetid chronic bronchitis following pneumonia and influenza. The improvement was very marked. The suggestion that syphilis was an underlying factor is disproved by a negative Wassermann reaction.

**Empyema.** So much is written about this subject that one hesitates in the beginning for fear that there is no end. I feel that with it all much satisfaction has come to those who have steadfastly resisted the pursuit of valves, suction appliances and "catheter method" and held to the surgical principle of free drainage. The mortality rate and the incidence of "chronic cavity" are the only real points at issue. Local anesthesia, and preliminary aspiration in desperate cases together with thorough drainage should solve the first though there will always be an irreducible minimum by reason of delay in diagnosis and virulent infection. In regard to the second, I am going to quote at length from Walton Martin's<sup>38</sup> sane paper: "I believe that chronic suppurative pleurisy, excepting when there are complicating conditions in the lung or an underlying tuberculous infection, should not occur. I feel sure that in the majority of cases there has been a failure to appreciate the fundamental principle involved in treating an infected cavity; that an absolutely free external passage for exudate must be observed in the after-care; that one must be always on the lookout for the possibility of secondary loculi and foci of infection and shut-off portions of the drainage tract; that in a widely drained cavity, surface contamination does not lead necessarily to reinfection, but that in a poorly drained cavity reinfection and secondary infection are very liable to occur. I believe that surgeons with very different ways of operating and very diverging ideas regarding after-care get equally good results provided these essentials are borne in mind: That the entrance of air through the thoracic wound to any desirable degree can be assured by very simple means; that although the danger of early operation in streptococcus infection while pneumonia is still present has been recently generally recognized, this by no means implies the desirability of a long delay and treatment by aspiration after the pneumonic process is over and the exudate is purulent or sero-purulent in character. I think no case should be allowed to leave a hospital with a drainage tube in the chest; that all patients with a closed, even if apparently sterile, pneumothorax should be kept under close

<sup>36</sup> *Therap. Halbmonat.*, 1920, xxxiv, 442.

<sup>37</sup> *Med. Klinik*, 1920, xvi, 336.

<sup>38</sup> *Annals of Surgery*, 1920, lxxii, 170.



observation until it disappears, I think that there should be a more general recognition that not only high temperature and obvious signs of infection indicate a pent-up collection of pus, but that a slight afternoon temperature, a rapid pulse, loss of appetite, vague discomfort in the chest—in short, a failure to return to vigorous health, are very suggestive of a hibernating pleural abscess.”



FIG. 28.—Pneumatic jacketed drainage tubes—three sizes.

The Dakin-Carrell method of antiseptic irrigation still continues to be highly thought of by most writers, but I am rather of the opinion that it seems more to prevent contamination from the wound than as a “sterilizer” of the cavity. Perhaps I ought to mention the Morelli method of aspiration drainage introduced to this country by Lincoln Davis.<sup>39</sup> Its features are the systematic induration of pneumothorax,

<sup>39</sup> *Annals of Surgery*, 1920, lxxii, 327. See also book by Morelli. Translated by Davis and Irving, M. M. Leonard, Boston, 1920.

continuous aspiration drainage combined with irrigation, and an air-tight pneumatic jacketed drainage tube. Morelli is insistent about the preliminary thoracentesis and its replacement with an equal amount of air in order to avoid increase of the negative pressure which would favor the reaccumulation of fluid. I have one of the bags (Fig. 28), but think the drainage tube is too small and too flimsy. I cannot see any advantage over other methods of valve drainage.

CHRONIC EMPYEMA. I have three excellent papers to abstract. Heuer<sup>40</sup> reports the results of treatment in 24 patients with long standing chronic empyema with *no operative mortality*. Five methods were practised: (1) Bismuth sterilization. There were six successes and one failure. He particularly praises the method in the long tubular intrapleural sinus tracts of tuberculous origin. (2) Substitution of a sterile extrapleural cavity for a septic intrapleural cavity by stripping the parietal pleura. The procedure proved to be feasible if the parietal pleura were not too greatly thickened. In the presence of a rigid, board-like pleura, however, the result was that when mobilized the pleura stretched across the thoracic cavity as a cord subtends an arc, and could not be brought into contact with the visceral pleura. For this reason the procedure was abandoned. (3) Excision of the mobilized parietal pleura over the empyemic cavity. Irrigation of the extrapleural cavity with Dakin's solution. After stereoscopic x-rays of bismuth injections of the cavity have been made to determine the size and position of the cavity, the sinus tract is carbolized, encircled by an incision, and dissected down to the pleura. Ten to 12 cm. of a single rib are excised and the parietal pleura stripped away from the chest wall well beyond the limits of the cavity. With as careful an observance of aseptic technic as possible, the parietal pleura is incised, the granulation tissue removed from the cavity, and its entire inner surface carbolized. The parietal pleura is then excised. The wound is closed, except for an opening large enough to permit the two tubes of our Dakin irrigating apparatus. In 4 cases the method was successful and the patients have been well for from nine months to one and one-half years. (4) Preliminary correction of the sinus tract and cavity, if necessary. Sterilization of the cavity with Dakin's solution. Secondary suture or spontaneous closure of the sinus tract. This method is practically that of Depage-Tuffier and led to successful results in 6 of 10 cases. In 1 of the 4 failures, the sinus, which reopened two weeks after its primary closure, closed spontaneously and has since remained closed. In another case included as a failure in this group, a subsequent operation resulted in the closure of the sinus and a complete cure. In only 2 cases, therefore, did he fail in the closure of the cavities before the patients left the hospital. (5) Immediate sterilization of chronic empyemic cavities with pure carbolic acid. Closure without drainage. The sinus tract is dissected out by a rather complicated method and the cavity carbolized throughout. The results were remarkably good.

Twenty patients were discharged from the hospital with their wounds

<sup>40</sup> Annals of Surgery, 1920, lxxii, 80.

healed and the only failures occurred in patients with active pulmonary tuberculosis, in whom a tuberculous empyema followed prolonged artificial pneumothorax treatment. I have presented this paper rather fully because it illustrates the value of "individualization" in the treat-

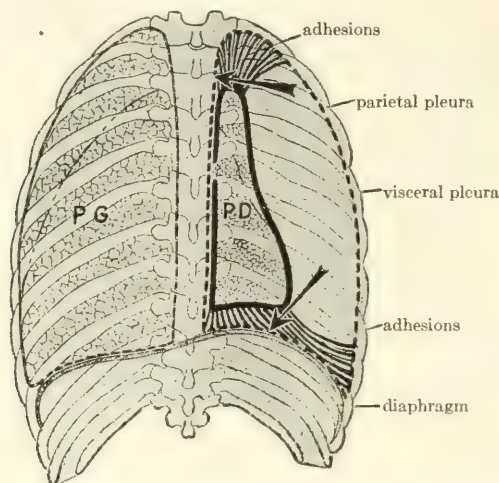


FIG. 29.—Points along which the incision should be carried at the periphery of the cavity.

ment of these cases. Hedblom<sup>41</sup> made chronic empyema the subject of his thesis. He reports of 150 cases from the Mayo Clinic. The essay is 38 pages long, opens with a splendid historical résumé and closes with an extensive bibliography. The methods of treatment were: (1) Simple rib resection, 42 cases. Mostly for cases operated elsewhere and who

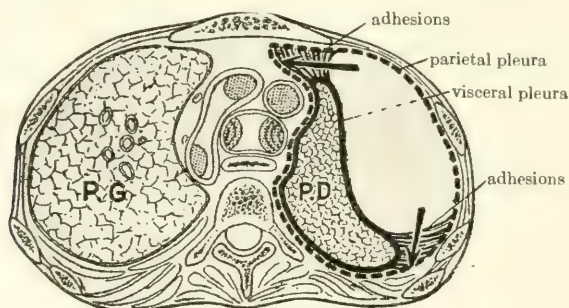


FIG. 30.—Diagram showing where the incisions should be carried in order to liberate the lung.

suffered from faulty drainage. Twenty-six made a complete recovery. (2) Dakin's solution with or without minor drainage operations, 51 cases. Thirty-four made a complete recovery. It is interesting to note

<sup>41</sup> *Annals of Surgery*, 1920, lxxii, 288.



that a large portion of the time spent in treatment was for the final obliteration of a cavity after it had been reduced 50 to 75 per cent. (3) Pulmonary decortication, 30 cases. The operation, except in some early cases before Dakin's solution was employed as a routine, was performed only after the antiseptic method had been used and a large cavity remained. Twenty cases were cured. (4) Plastic operation involving the collapse of the chest wall, 27 cases. Fifteen cases were cured.

Of the 150 cases, 95 made a complete recovery, 21 had a residual sinus, 28 did not report, and 4 died.

Tuffier<sup>42</sup> also writes on chronic empyema. The most interesting part of his paper is that on *decortication*. He says that total decortication has been successful only for cavities limited to the size of the two fists and he has never decorticated an entire pleural cavity. In other cases he incises the periphery at the union of the parietal and pulmonary pleural to liberate the lung (Figs. 29 and 30).

## THE ESOPHAGUS.

**Stricture of the Esophagus.** When confronted with the symptoms of this condition most of us instinctively think only of two causes, stricture from swallowed corrosives or carcinoma. Gatewood<sup>43</sup> gives a complete list of the causes in tabular form.

### A. Extrinsic:

- I. Tumors of the neck, as enlarged thyroid, retropharyngeal tumors, and carcinoma of the larynx.
- II. Mediastinal swellings, as
  - (a) Tuberculous spondylitis with abscess formation.
  - (b) Mediastinal infection, as peri-esophageal abscess, tuberculous lymphadenitis, etc.
  - (c) Tumors, such as Hodgkin's disease and lymphosarcoma.
  - (d) Aneurysm of the aorta, and
  - (e) Pericardial effusions.

### B. Intrinsic:

#### I. Congenital—rare.

#### II. Acquired:

##### (a) Simple or benign:

1. Cicatricial, due to swallowing of corrosives.
2. Due to healing of a gastric ulcer at the cardia, or of an esophageal ulcer.
3. Inflammatory—tuberculosis or lues (very rare).
4. Esophageal diverticula and benign growths, such as polypi.

##### (b) Malignant—epitheliomata.

The benign stricture can usually be dilated by bougies if recognized early enough, but occasionally the lumen is so small as not to permit

<sup>42</sup> Annals of Surgery, 1920, lxxii.

<sup>43</sup> Surgical Clinics, Chicago, 1920, iv, 69

their passage. Furthermore, in tortuous strictures and in those old strictures in which a marked dilatation of the esophagus has occurred above the stricture, this method frequently encounters insurmountable

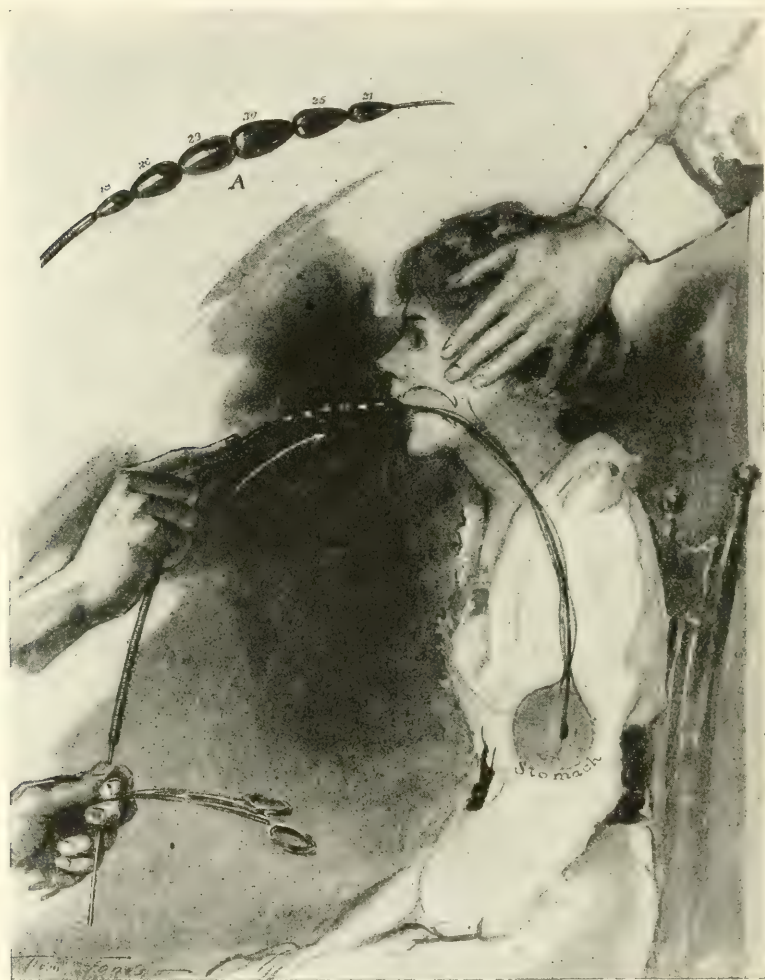


FIG. 31.—With the thread, swallowed several days previously, as a guide, piano wire is passed through the stricture into the stomach; olive tips are then threaded on the wire to form a spindle-shaped dilator, the largest tips in the middle and the smallest at each end, and are forced through the stricture by means of the flexible, spring bougie which is also threaded over the wire. The stomach end of the wire is enlarged so that the olive tips cannot be forced over it. When the piano wire is withdrawn from the stomach the tips are carried out on it. A, Arrangement of olive tips to form the most efficient dilator. (Gatewood, in *Surgical Clinics of Chicago*.)

difficulties. Numerous false passages and perforations, with resultant mediastinitis, have followed the use of the ordinary bougie. If flexible bougies were used to avoid the danger of perforation, they frequently curled upon themselves without penetrating the strictures.

Gatewood describes the Sippy method for tight strictures, and reports a case in which it was used. The illustration (Fig. 31) explains the method better than words. About 4 yards of string should be swallowed. Corticelli C. silk is used for tight strictures and No. 8 or No. 12 woven silk thread for larger ones. The olives are pierced and threaded over the wire. I have had bougies made for me after the model used by Bunts of Cleveland and pierced to allow threading over the wire. Among the startling advances made in chest surgery none is so brilliant as the methods of reconstructing the esophagus when an absolutely impermeable stricture exists. I have three contributions before me, but to my great regret am unable to do more with the two most important except present them in abstract as I was unable to obtain the original articles. Axhausen<sup>44</sup> reports 4 cases of irreparable stenosis of the esophagus from caustic action in which he tunnelled a new esophagus under the skin of the chest. The technic and ultimate outcome are illustrated. The new esophagus answered its purpose perfectly in 59 per cent. of the cases, one man living in perfect health and comfort during the five years to date. The experiences are instructive in a number of points as Axhausen describes. The emaciation of the patient is no criterion as to the resisting power. One of his patients was a boy of eight, with a large thymus, and he succumbed to the effect of chloroform at the tenth sitting. Ether had been used in the preceding operations, and success seemed assured.

Another group of these cases was reported by Hirschmann<sup>45</sup> the outcome of which was so excellent that he does not hesitate to commend his technic for the systematic relief of absolutely impermeable stenosis of the esophagus. One young woman is in the best of health now, a year and a half after the operation. The various steps are illustrated. A short loop of the jejunum is moved to a bed under the skin of the chest, and one end is implanted in the stomach. Then the skin is incised to the right and left of the median line, these parallel incisions 6 or 7 cm. apart. The inner lips of the two incisions are turned back and sutured together, thus forming a skin-lined tunnel from throat to stomach. The stump of the esophagus is brought out through the skin in the neck, and sutured to the upper end of the skin-lined tunnel. Then the lower end of the latter is sutured to the short segment of the bowel loop that has been brought up to bridge the gap between the skin-tunnel and the stomach. In all the steps of the operation he is careful to leave sufficient blood supply for all parts concerned.

A third paper by Bohmansson<sup>46</sup> is fortunately available, and in addition to an excellent summary of the literature, gives a report of a truly remarkable case. The patient, aged thirty-eight years, in December, 1918, drank a wineglassful of lye. A stricture of the esophagus rapidly developed, of small calibre, and situated 21 cm. from the incision teeth. On March 8, 1919, a Witzel gastrostomy was per-

<sup>44</sup> *Beit. z. klin. Chir.*, 1920, cxx, 163. Abstract Journal of the American Medical Association, September 11, 1920.

<sup>45</sup> *Therap. d. Gegeuro*, 1919, lx, 368.

<sup>46</sup> *Acta Scand. Chir.*, 1920, liii, 99.



formed under local anesthesia, through a lateral left-sided incision parallel to the costal margin. On May 5, 1919, through a median incision, the abdomen was opened under ether anesthesia. The upper jejunal loop was isolated.

The translation of the article is not clear regarding the next step. "The vasa recta were tied beneath up to the rib arch on that place where the mesentery was longest. The mesentery was afterward cut loose aborally along the arch to the next bloodvessel system. It was now tried how many vasa recta could be tied beneath without the nutrition being hazarded in the most oral part of the intestine." The intestine was divided orally and the stumps invaginated by suture, also aborally 5 cm. below the afferent vessels and the stumps likewise closed. The integrity of the intestine was restored by a side-to-side anastomosis.

The excluded intestinal loop was straightened by a dissection of the peritoneal serosa "up to the rib arch" until it attained a length of 30 cm. A hole was made in the transverse mesocolon and also through the gastrocolic omentum and the loop brought through. The holes were closed snugly about the bloodvessel stalk. The aboral end of the loop was then implanted end to side into the stomach near the lesser curvature high on the fundus.

A canal was then tunnelled under the skin of the chest up to the level of the second left rib near the sternum and an opening made here. The tunnel was then widened and the oral end of the loop pulled up and anchored. This incision was entirely closed over the end of the loop and the abdomen also closed after suturing the peritoneum around the loop at the site of the stomach anastomosis. It should be remembered that the loop was still closed above but its position enabled it to empty the mucus into the stomach. Bohmansson was afraid that if he made a fistula above, infection would result. The patient did well but lost some weight, being nourished only through the gastrostomy.

On June 6, 1919, the third operation was performed under paravertebral anesthesia (C3-C4 Hartel). An incision was made along the sternomastoid muscle, the esophagus exposed and drawn into the wound. At as low a point as possible, the esophagus was divided and both ends sutured to the skin. Some infection developed and further progress was delayed, but in the meanwhile the hair on the chest was epilated by Roentgen-ray exposure.

On October 11, 1919, under ether anesthesia, a skin tube was formed connecting the opening in the neck with the intestine, which was opened and sutured to the edges of the skin tube. A new esophagus was thus formed. Several small plastic operations were required to close leaks, but on February 5, 1920, the gastrostomy was allowed to close. Bohmansson states that on April 20, 1920, "a roentgen examination was made of the passage with barium porridge. The porridge passes rather slowly through the intestinal canal which shows a healthy peristalsis. The oral place in the stomach is situated near the small curvature about in the middle of the corpus. That part of the intestinal loop situated within the abdominal cavity describes a little convex curve downward to the right before the orifice. There is no blind sac or dilatation of its lowest part.

The remainder of the article is concerned with certain moot points in the technic particularly showing the advantage of anastomosing the loop to the stomach at the first sitting, thereby avoiding a second laparotomy, difficult by reason of adhesions. Bohmansson thinks that the most difficult part of the operation is the placing of the gullet in the neck because of (1) the fear of mediastinitis, and (2) of injury to the nutrition of the esophagus. He made the interesting physiologic observation that during the time when the fistula existed in the neck the masticated food spurted out through the fistula with real force after the act of swallowing. "This is but a support to the observations which have been made at various esophageal plastic operations, that the pressing down of the food takes place almost exclusively by means of the strong pharyngeal muscular system, and that the peristaltic proper to the transplanted intestine plays little or no part in the same." It has been pointed out that the peristaltic movements in the transplanted loop gradually cease but they were still present, though weakened, after a year in Bohmansson's case.

**Diverticula of the Esophagus.** Last year I abstracted certain papers by Judd, Halstead, and others. In another paper, Judd<sup>47</sup> reports that he has operated in 54 cases of esophageal diverticula, with 3 deaths; two are included in the former report of 35 cases. Two of the patients died following a one-stage operation, the third following the first stage of a two-stage operation. From a review of the histories of his cases, he was unable to obtain any other clue to the etiology than the weakness in the wall of the upper end of the esophagus. There had been no history of trauma or any evidence of anything unusual in mastication or deglutition. The first symptom noticed in nearly all cases was dryness in the throat and a gradually increasing difficulty in swallowing. The sensation of some foreign material in the throat was often mentioned. These symptoms led to accumulations of mucus, and later undigested particles of food were raised. Dysphagia and a gurgling noise in the throat are mentioned as an early symptom by nearly all patients. As the sac increases in size, the patient has the sensation of pressure and often the esophagus closes, so that there is almost a complete stenosis of the lumen. This sometimes leads to the diagnosis of carcinoma or stricture for which not a few of these patients have been treated.

Judd prefers the two-stage operation as suggested by Murphy and C. H. Mayo (see Fig. 32). Neither the esophagus nor the diverticular sac is open so that the surrounding tissues and spaces are not exposed to any infection. By the removal of the sac from its place behind the esophagus, the deformity in the esophagus is corrected and immediately afterward the patient swallows without difficulty. The sac is left in this position for ten or twelve days, during which time the patient is able to be up and around, and can leave the hospital if he wishes. Differing from the Murphy plan, he does not twist the neck of the sac. The second stage of the operation is performed under local anesthesia.

<sup>47</sup> Arch. Surg., 1920, i, 38.

**Radium Treatment of Cancer of the Esophagus.** But few patients are seen early enough or in good enough condition to withstand the severity of the operation devised for removal of the esophagus. Furthermore, but few surgeons would attempt this operation. For these reasons most

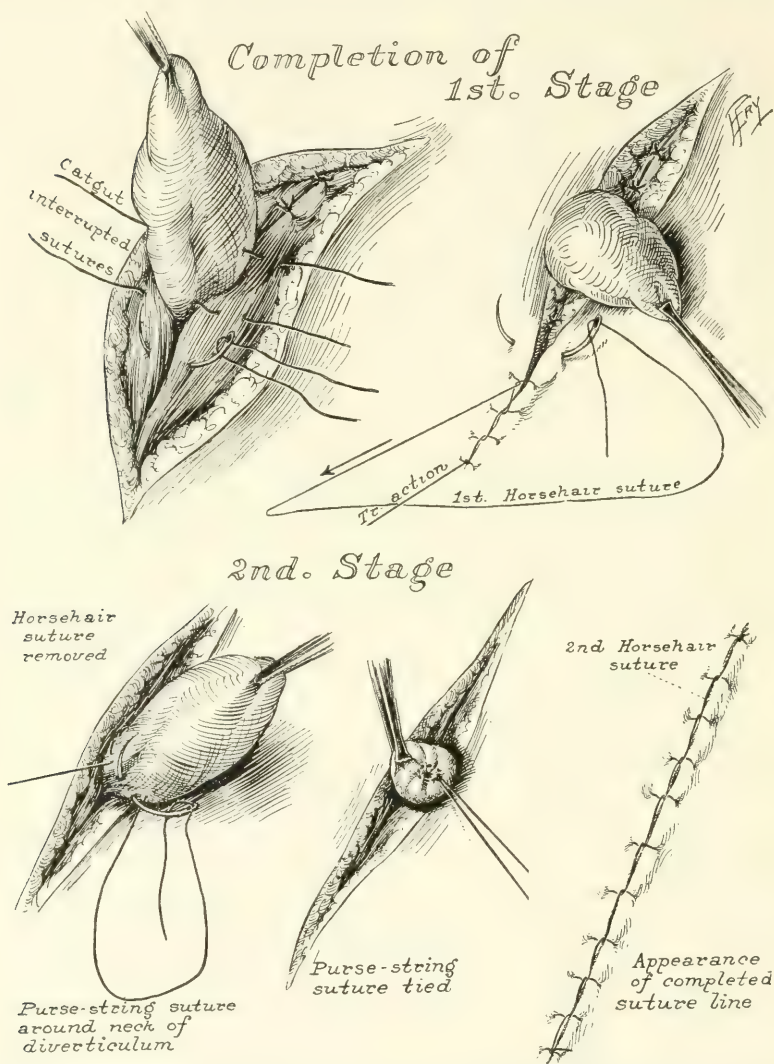


FIG. 32.—Prolapse of diverticulum from the wound at the end of the first stage of the operation. Freeing and excision of the sac at the second stage.

cases will be treated simply by a gastrostomy and by radium appliances to the esophagus and crosswise exposures on the neck. Mills and Kimbrough<sup>48</sup> believed that this method of treating cancer of the esophagus

<sup>48</sup> Journal of the American Medical Association, 1920, lxxiv, 1570.



holds out some hope. They believe that in order to attain successful results certain requisites are necessary: (1) A knowledge of the location and physical peculiarities of the tumor and the resulting stricture, especially as to location, extent, direction, and the degree of stenosis; (2) a means of effective and non-traumatizing canalization of the cancerous stricture; (3) a mechanical means of maintaining the radium in direct application with the tumor; (4) a ready means of frequent observation as to the position of the radium during the period of treatment, and (5) a careful selection as to dose, filtration, and frequency of treatment guided by such experience as we have and the individual peculiarities of the case. They report 11 cases treated with radium, most of which have been under observation for less than a year. Five patients have died and 1 case is alive and in good shape eighteen months after the first treatment without evidence of metastasis. The general improvement was striking and there seems no question but that life is prolonged by the treatment. Dufourmentel<sup>49</sup> reports a few cases in which the patients have been relieved from pain, and swallowing has been improved and there has been a gain in weight during the five months or more since radium treatment of the cancer of the esophagus is being systematically applied. Others have survived for from thirteen months to three years, and during this remission they were relieved of pains and dysphagia.

<sup>49</sup> *Paris Med.*, 1920, x, 124.



# INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA AND INFLUENZA.

BY JOHN RUHRÄH, M.D.

THE journals of 1920, while they contain certain things of extraordinary interest as regards infectious diseases, are, for the most part, rather a dreary lot, and are showing the effects of the war in that the great number of contributions dealing with infectious diseases are trivial or are what may be regarded as a sort of backwash from the work done by men in the service, belated contributions still being printed on the epidemic of influenza, on pneumonia in the war camps and similar subjects; important topics, it is true, but which have, in the main, lost their interest.

Anyone reading the journals for the past few years would be struck by the same thing that impressed Sydenham so remarkably, being what he described as the epidemic constitution of the various years; a term used by Hippocrates. In 1916, poliomyelitis held the center of the stage; in 1918, influenza; in 1919 and 1920, epidemic encephalitis. And we may confidently await either next year or the year following some other infection, not necessarily a new one, but suddenly springing into the public ken through the large number of cases and perhaps even fatalities.

Modern preventive medicine has worked wonders. Smallpox has all but disappeared, yellow fever is disappearing, tuberculosis, diphtheria, typhoid fever and numerous other scourges have been robbed, if not of all, of a major portion of their terrors. But the medical student of today need have no fear that there will not be plenty of material for him to practise on, for no sooner do we control one infection than another seems to come up to take its place. There is an old saying that God is good to the Irish. Perhaps He extends His beneficent sphere to include the medical men as well.

By far the most interesting disease in the literature of the past year is epidemic encephalitis of which an especially full account is given in the succeeding pages and to which the reader is referred for further information. The increased use of home canning and certain other factors have led to a number of epidemics of botulism, which are deserving of notice. Among the other features to which attention may be called are the use of arsphenamin or salvarsan in diseases other than syphilis; the autoserum treatment of chorea as suggested by Goodman; and the improvements in the treatment of leprosy. A subject which fills the journals but which has failed to penetrate into the active life of the physician is the production of an active immunity against diph-



theria, a simple enough procedure, but one which we do not seem to have availed ourselves of as largely as its importance would warrant.

Attention may also be called to Regan's article on the influence of poliomyelitis on the other infectious diseases, a contribution furnishing food for much thought. And lastly, but not least, we may chronicle the stealthy, but nevertheless seemingly certain, progress of plague in this country. The control of plague seems to be in getting rid of the rats. Now is the time to do it. This should appeal not only from the standpoint of protecting the country from plague, but in reducing the enormous damage done by these pests throughout the entire land.

**Professional Secrecy and Infectious Diseases.** In former days whatever a patient told the physician was regarded as a privileged communication and, as a general thing, the knowledge so acquired never went further than the medical man who heard it. With the modern tendency of supervision over the spread of infectious diseases, professional secrecy seems to be lapsing, both in this country and abroad. The Superior Court of Nebraska<sup>1</sup> has recently held that a physician is not liable for reporting venereal diseases. The case in question consisted of a stranger who was stopping at a small hotel. He went to the family physician of the hotel-keeper, who told him that he suspected that he had syphilis. The physician told the patient the danger of communicating the disease at the hotel and requested him to leave the next day which he promised to do. The physician was the regular hotel doctor and while making a professional call at the hotel the next day he learned that the guest had not left, whereupon he told the proprietor that he thought the patient was afflicted with a contagious disease and advised that certain precautions be taken. The guest's belongings were put in the hallway, his room fumigated and he was forced to leave. He thereafter brought action against the physician claiming that there had been a breach of the duty of secrecy. In discussing a physician's duty relative to professional secrecy, the Court said:

"No patient can expect that if his malady is found to be of a dangerously contagious nature he can still require it to be kept secret from those to whom, if there was no disclosure, such disease would be transmitted. The information given to a physician by his patient, though confidential, must, it seems to us, be given and received subject to the qualifications that if the patient's disease is found to be of a dangerous and so highly contagious or infectious a nature that it will necessarily be transmitted to others unless the danger of contagion is disclosed to them, then the physician should, in that event, if no other means of protection is possible, be privileged to make so much of a disclosure to such persons as is necessary to prevent the spread of the disease. A disclosure in such case would, it follows, not be a betrayal of the confidence of the patient, since the patient must know, when he imparts the information or subjects himself to the examination, that, in the exception stated, his disease may be disclosed."

<sup>1</sup> Public Health Reports, August 13, 1920, p. 1928.

Of importance in this connection is the following extract from an editor in the *British Medical Journal*, July 10, 1920

"Is there in the problem of the prevention of venereal disease any ground for relaxing the rule of professional secrecy which has prevailed hitherto? We have seen that the foundation stone on which the whole structure of the relations between patient and doctor has been built, and to which we largely owe our present power of dealing effectively with the evil, is the confidence of the public built upon this rule of secrecy. It is admitted that exceptions have to be made in the public interest, and have been made in the past, but it is so difficult to define these exceptions in terms which would not open the door to a too great laxity of interpretation, that at the recent Representative Meeting it was thought best for the profession to maintain the rule in the form that the medical practitioner should not, without the patient's consent, voluntarily disclose information which he has obtained from such patient in the exercise of his professional duties. It is clear that the word 'voluntarily' exonerates him if he discloses information under the compulsion of a court law or the behest of an Act of Parliament. It does not clearly exonerate him in the other cases, and the onus of justification is thrown on him. The guiding principles must be the gravity and extreme probability of the impending evil to another person and the impossibility of preventing it by any less drastic step.

"The wording of the rule in the past has been slightly more stringent than this, but even so it has served as a good guide, and no doctor would be harshly judged who, knowing professionally that a man deliberately intended to marry when liable to convey the infection of syphilis—with imminent risk to the woman and her possible children, should, after exhausting every other means of preventing such a thing, find himself driven to take the step of disclosing the danger to those who could prevent it happening. Just as a doctor must sometimes defy authority urging him to disclose his knowledge, so in certain very special cases he may be justified in departing from the rule of the profession binding him to secrecy, but in either case he must make sure that he can justify his course of action in the particular circumstance of the case."

**The Work of the Rockefeller Foundation.** Vincent<sup>2</sup> has given an interesting account of the activities of the Rockefeller Foundation. The amount of work done is remarkable. It would not be possible within this space to give any adequate account of it, but it is important to know that yellow fever control has been extended successfully in Ecuador, Nicaragua, Honduras and Salvador, and that coöperative campaigns for the cure and prevention of hookworm disease was made in thirteen southern states of the American Union and seven of the states of Brazil and five islands of the West Indies, and five countries of Central America, in Ceylon, the Seychelles Islands, China and Queensland. The Foundation also carried on demonstrations in the control of malaria in Arkansas and Mississippi, and arrangements have been made for extending the program to eight other southern states.

<sup>2</sup> The Rockefeller Foundation, a review for 1919.

In France, tuberculosis has been the chief object of activity and includes twenty-one of the departments. Among the numerous hospitals and schools must be mentioned the coöperation and maintenance of an Institution of Hygiene in the Sao Paulo University in Brazil, and the entire maintenance of a School of Hygiene and Public Health at the Johns Hopkins University. An extended notice is made in another place in this review of the work of Noguchi on the organism causing yellow fever.

The review is well worth reading and closes with the statement: "The war against disease is a world war. Commerce carries dangerous infections, as well as goods and ideas. The health problems of the remotest land concern all peoples. More and more, nations are coming to recognize their interdependence in health as in industry, government, science and culture. There are even now foreshadowings of world-wide coöperation in combating the maladies which have long threatened humanity. For this new campaign leaders are needed to extend the frontiers of medical science, to teach, to organize, to administer. Demonstrations are required to convince communities and nations that diseases can be controlled and even eradicated. The Rockefeller Foundation, enlisted for this world-wide campaign against disease, is coöperating with many agencies in five continents, is fostering the growth of international confidence and good will, and is seeking the fulfillment of its chartered purpose—"to promote the well-being of mankind throughout the world."

**The Epidemiological Point of View to Influenza, Pneumonia and Allied Epidemics.** In the section on Influenza I noted one article by Crookshank. Another article in a more popular vein deserves a word in passing.<sup>3</sup> Crookshank is of the opinion that we should take a very broad view of the epidemics, especially those producing very large disorders of the public health. He believes that it is as illogical to blame the epidemics on certain bacteria as it would be to blame the late war on bullets and poisoned gases. The bullets and poisoned gases caused the deaths, but not the war itself. Crookshank believes that the only way that real progress can be made in epidemiology is to study the nature of the factors that favor the propagation and dissemination of these special microorganisms at periodical intervals, and he thinks that the position of the epidemiologist differs from that of the clinical physician very much as that of the statesman and that of the soldier.

He believes that the epidemiologist should inquire why pestilences occur while pandemics occur? What causes the exaltation in virulence? The epidemics and pandemics recur from time to time very much like wars and revolutions. Some are local, some involve considerable territory, and some are more or less general. Crookshank believes that more attention should be paid to the occurrence of premonitory epidemics and peculiar forms of diseases which have preceded the pandemics of influenza, such as the outbreaks which he states are so often

<sup>3</sup> Journal of the Royal Sanitary Institute, 1920, vol. xli, No. 2.



attributed to eating of various foods. He believes that the botulism that preceded influenza in the spring of 1918 comes under this head. This subject is also the subject of a study of Hamer.<sup>4</sup> This whole subject is one worthy of very careful attention of those interested in public health.

**The Carrier in Food Poisoning.** The origin of food poisoning is not always clear, even when the infection is traced to some particular article of diet. Priestley<sup>5</sup> had occasion to study a remarkable outbreak occurring in Lambeth. Ten persons were living in a house; all were affected; and one died. On Saturday a stew of steak and liver had been prepared and consumed, the gravy being saved until the following day and warmed up with a Yorkshire pudding. On the previous Thursday the wife of the landlord, who undertook the preparation of the food, was taken ill and the climax of her illness was reached on Saturday night, although she continued to attend to her household duties. The organism in this case was traced by bacteriologic investigation to the series of individuals concerned, as well as the gravy itself. A report from the Lister Institute proved it to be the mutton type of the large Paratyphoid B. group.

This offers another instance of the importance of supervising the health of those having to do with the preparation of food, but one imagines that any propaganda along this line with the present dearth of cooks would not meet with any popular response.

**A New Biflagellated Protozoan in Man.** Wight and Lucké,<sup>6</sup> in studying the cultures taken at necropsies, found what appears to be a hitherto undescribed flagellate protozoan. The organism was isolated in three individuals: in the lung in one instance, in the sphenoidal sinus in the second, and in the heart blood in the third. The work was done at the time of the influenzal epidemic at the Base Hospital at Camp Zachary Taylor, Kentucky, and the pressure of work did not permit a thorough investigation of the organism at that time. Klebs, in the epidemic of 1890, described minute monads and believed that they played a part in the pathology of influenza, but inasmuch as these organisms were found by Wight and Lucké in only three instances out of 126 influenzal necropsies, they are inclined to look upon them as accidental invaders, possibly from the oral cavity.

The organism in question is a biflagellated protozoön, round or pear-shaped and with a kinetonucleus. Various flagellated protozoan have been isolated from the mouth or lungs. The protozoan described has not been definitely placed. Schmidt and St. Artault named the organisms found in the lungs of man *Trichomonas pulmonalis*; and Prowazek described a variety of *Trichomonas intestinalis* that were isolated from the mouth. Possessing two flagella would place the organism in the family of Bodonidæ, Bütschli, while the kinetonucleus would place them in the genus *Prowazekia*, Hartman and Chagas.

<sup>4</sup> Reports of the Medical Officer of the London County Council for 1917, 1918, 1919.

<sup>5</sup> Editorial, *The Lancet*, August 14, 1920, p. 364.

<sup>6</sup> *Journal of Parasitology*, March, 1920, p. 140.

**Dairy Infection with the *Streptococcus Epidemicus*.** In February, 1917, there was prevalent in Boston an epidemic of a disease characterized chiefly by an adenitis, but also by sore-throat, pharyngitis and tonsillitis. These patients were, for the most part, using milk from a dairy producing a high grade of raw milk. The infection was traced to the milk from a single quarter of the udder of a cow in a dairy of 112 cows producing an otherwise excellent grade of milk. A study of the personnel of the dairy showed that a number were infected, but it was impossible to trace the infection of the cow's udder to any of these. It seems probable that since the streptococcus isolated from the cow was in every respect like streptococci isolated from patients and milkers, that the infection came from this source, as the streptococci were different from those usually found in normal cows or cows with garget.

The organism in question was one named by Davis, *Streptococcus epidemicus*, a term which is used tentatively as the organism is so near like the *Streptococcus pyogenes* that Brown and Orcutt<sup>7</sup> believe that it may be regarded as a well-defined variety of the latter rather than as a true species. They suggest that if this is found to be the case it be called the *Streptococcus pyogenes* var. *epidemicus*, a return to the old pyramiding of names of things.

**An Unrecognized Pathway for Bacterial Invasion of the Respiratory Tract.** A very pretty piece of work on this subject has been done by Winternitz, Smith and Robinson.<sup>8</sup> Their article is beautifully illustrated with cuts of their preparations. As a result of their observations they conclude:

"The submucosa of the trachea contains a rich plexus of lymphatics, prominent everywhere and devoid of valves. At the bifurcation of the trachea, anastomosis occurs, with similar plexuses in the bronchi, and this phenomenon is repeated throughout the region of the cartilage-bearing bronchi. At the bifurcation of the trachea, as well as of the bronchi, there is drainage in the lymph glands and anastomosis with periarterial and peribronchial lymphatics. When the lymphatics are injected, the larger portion of the material is diverted at these bifurcations, but continuity of the lymphatic system in the tracheal and bronchial submucosæ is demonstrable.

Pneumococci introduced by needle puncture through the skin into the lumen of the trachea or by insufflation, provided the insufflating catheter damages the epithelium of the trachea, spread by way of the lymphatics to the lung. The lymphatics of the submucosa of the trachea, then, afford a direct pathway of infection to the lung. Although this lymphatic system provides a pathway for infection, it may also serve as a protective mechanism against pulmonary infection, for the drainage of the submucosa of the trachea and bronchi is largely diverted as the lung is approached to the protecting regional lymph glands."

**Vaccination by the Tracheal Route.**—The continued investigations of various laboratory workers are slowly clearing up many problems in

<sup>7</sup> Journal of Experimental Medicine, January 1, 1920, p. 49.

<sup>8</sup> Bulletin of Johns Hopkins Hospital, March, 1920, p. 63.

connection with immunity, and while it may be a very long time before our knowledge is anything like as complete as we can hope for, it seems pretty certain that this end will be eventually attained. Besredka<sup>9</sup> has made a large number of observations on the subject of infection and immunity by injecting vaccines and bacteria into the trachea, and he comes to the conclusion that the pulmonary apparatus does not prevent the toxins and soluble poisons from penetrating rapidly into the general circulation. On the other hand, it presents a solid barrier against the penetration of the various forms of bacteria. In comparing the resistance of the animals inoculated by the tracheal method on the one hand, and with the same virus into the veins on the other, the importance of the pulmonary barrier becomes evident. In fact, the failure of the barrier may be expressed in figures, by comparing the differences between the normal animals and one which has been immunized by the tracheal method. The animal so treated can resist fifty times the dose that would kill the animal deprived of its pulmonary defence. This figure gives some idea of the part played by the respiratory apparatus in the natural immunity. By bringing the vaccines directly to the respiratory apparatus, one can increase the natural resistance by creating a local artificial immunity.

**The Trypanocidal Action of Arsenic and Antimony Compounds.** A very considerable amount of work is being done on chemotherapy, particularly with drugs that are known to be active in killing parasites that invade the body. Voegtlein, Smith, Crane, Wright and Connell<sup>10</sup> have published their researches on various antimony and arsenic compounds. Most of the observations were made on albino rats infected with *Trypanosoma equiperdum*. This was chosen because it is essentially a blood infection and not of the tissues, and secondly because the disease is easily propagated and in its regular course kills in a few days, and, lastly, the course of the disease can be followed by counting the number of parasites in the blood according to the Kolmer method.

The toxicity of the drugs were first studied, the minimum lethal dose (M. L. D.) being first determined and after that the next lower dose at which the majority of the animals survived or the maximum tolerative dose (M. T. D.). Differences in the toxicity and the parasitical activity of various arsenic and antimony preparations have been explained on the hypothesis that they must be changed to one type, the oxides, before exerting their principal toxic action. The length of time taken to oxidize the various drugs represents the length of time between giving the injection and at which it becomes effective. They also found that there was a sharply defined minimum effective dose below which the drug had no appreciable effect upon the parasites. This minimum effective dose varies with different preparations, due partly to the nature of the reaction between the drug and the parasites and partly by the absorption of the drug by some of the tissues of the host. The results of their observations are illustrated by two charts that are well worthy of careful study.

<sup>9</sup> Annales de l'Institut Pasteur, June, 1920, p. 361.

<sup>10</sup> Public Health Reports, September 24, 1920, p. 2264.



**The Use of Arsphenamin in Non-syphilitic Diseases.** A number of observers studying the spirochetal infections in the higher animals found that they had many characteristics in common, of particular interest

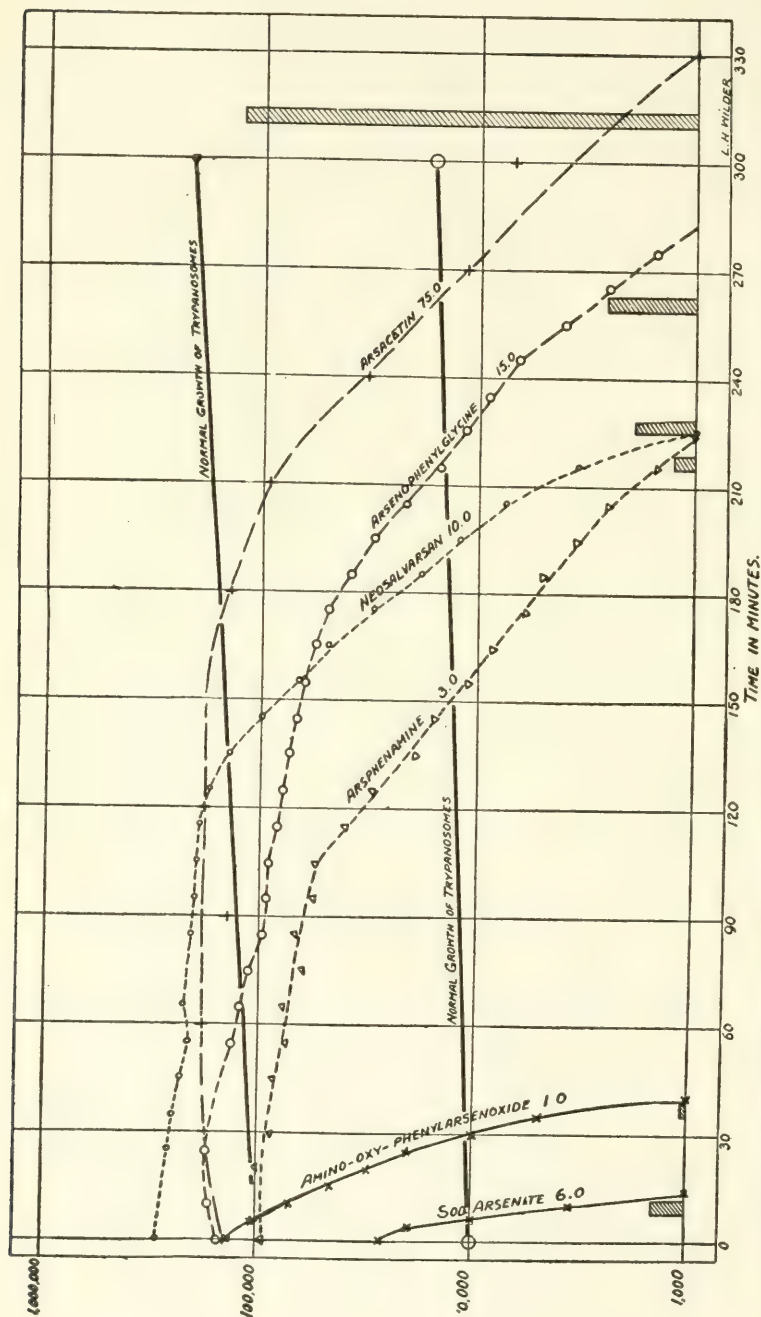


FIG. 33.—This chart illustrates the difference in the rate of the trypanocidal action of various arsenicals. The ordinates represent the number of trypanosomes per cu. mm. of blood, the abscissa, the time in minutes following the injection of the drug, the shaded blocks the relative amount of arsenic injected. It will be noted that arsphenamin and the pentavalent arsenicals show a marked latent period during which the trypanosomes are not reduced in number, whereas in the case of the oxidation product of arsphenamin (amino-oxy-phenylarsenous oxide) and sodium arsenite the parasites are rapidly killed. The former type of compounds have to be changed (oxidized) in the body before they can exert an action on the parasites. It will be noted that the absolute amount of arsenic to bring about the death of the parasites is ever so much larger in the case of the pentavalent arsenicals than with arsphenamin and its oxidation product.

being their reaction to drugs used to kill them, and their thermal death point. An important contribution by Reasoner and Nichols<sup>11</sup> sums up what is known about the more important of these organisms. They give the following list showing gradations in pathogenicity.

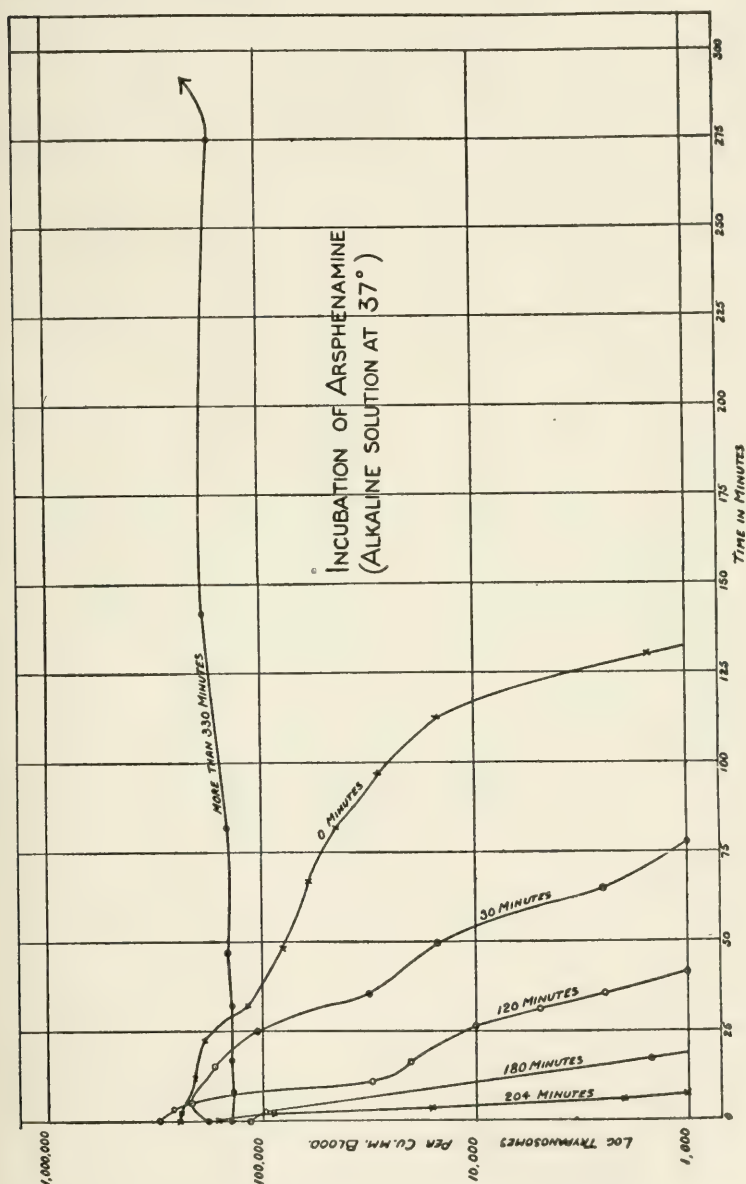


FIG. 34.—This chart shows how the standing of an alkaline solution of arspenamine causes first a marked increase in the rate of parasitocidal action, due to conversion of the arsenamine into the corresponding highly toxic "oxide," R. As = As R → R. As = O. On further standing, the activity is completely lost on account of complete oxidation to pentavalent arsenic. This same process occurs in the body.

"*Spirocheta plicatilis*, Ehrenberg, 1833, a free living organism found in stagnant water.

<sup>11</sup> Journal of the American Medical Association, September 4, 1920, p. 645.

"*Cristispira balbiana*, Certes, 1882 (*Spirocheta balbianii*), has developed parasitic properties for a cold-blooded animal and is found in the crystalline style of the oyster.

"*Treponema dentium*, Koch, 1887 (*Spirocheta dentium*), is ordinarily a saprophytic organism found commonly in the normal human mouth. It may invade damaged tissue, but its exact role in such invasion is not known.

"*Spirocheta vincenti*, R. Blanchard, 1907 (*Spirocheta vincenti*), is the probable cause of local lesions on the human mucous membrane, and it invades the underlying tissues but is not believed to invade regularly the blood stream.

"*Spirocheta recurrentis*, Lebert, 1874 (*Spiroschaudinnia recurrentis*, *Spirocheta recurrentis*), invades the human blood stream but does not produce local lesions, it produces an acute disease of a relapsing type and is self-limiting.

"*Spirocheta morsus-muris* (*Spirocheta morsus-muris*), the organism of rat-bite fever, produces a local lesion at the point of entrance and passes through the lymph nodes and invades the blood stream and tissues. It produces an acute disease of a relapsing type and is self-limiting.

"*Spirocheta pertenuis*, Castellani, 1905 (*Spirocheta pertenuis*), begins its invasion by a local lesion, invades the blood stream, then localizes and produces surface and occasionally deep lesions. It may also spread by autoinoculation. It is self-limiting. Yaws is not a congenital disease.

"*Spirocheta pallida*, Schaudinn, 1905 (*Spirocheta pallida*), produces at first a local lesion, invades the blood stream and involves all tissues and may be transmitted to the next generation. The disease does not tend toward recovery."

The original work of arsphenamin (salvarsan) was done not only with the organism of syphilis, but with that of relapsing fever, of yaws and with the *Spirocheta gallinarum*, a disease of fowls. This drug has been given to patients suffering with almost every disease, but its good effects seem to be limited to syphilis and to diseases caused by spirochete and in a few instances, to lesser degree, to certain protozoa and bacterial infections, but it does not have a beneficial effect on all spirochetal diseases as Weil's disease and yellow fever do not seem to be affected favorably by it.

The drug may therefore be recommended in the following diseases:

VINCENT'S ANGINA yields to the use of neoarsphenamin locally or applied in powdered form or with a glycerin swab, or by local applications twice daily of 10 per cent. arsphenamin in glycerin. If this fails to control the disease or if the lesions have become extensive or if serious complications exist, Reasoner and Nichols advise the use of intravenous injections of neoarsphenamin in medium size doses.

PULMONARY SPIROCHETOSIS; fetid spirillar bronchitis; pulmonary gangrene. Spirochetal lung involvements have been described by various observers in such widely separated regions as the Uganda, Peru, Egypt and other places. Fetid spirillar bronchitis or pulmonary



gangrene is always characterized by a fetid breath and the organism described by Nolf<sup>12</sup> is very similar to an organism described by Noguchi under the name of *Treponema macrodentium*. Nolf believes that arsphenamin given early has a decidedly curative effect, but the outlook is not good when the later stages of the disease are dealt with.

PYORRHEA ALVEOLARIS is a condition about which there has been much discussion as to the cause. There are certain cases in which arsphenamin produces favorable results which are not always permanent. Where such results were obtained it seems highly probable that the spirochete are responsible, either primarily or secondarily.

RELAPSING FEVER. Practically all the authorities recommend arsphenamin in these fevers. Manson and Thornton suggested that the drug be given in the first attack of fever and failing in this, wait until the first relapse and then give it on the rise of temperature and they state that it should never be given in an apyrexial period. When a further relapse occurs repeat the dose on the rise of temperature. They believe that, at least in the African form of the disease, this will prove specific.

RAT-BITE FEVER, which has been attracting so much attention of recent years, seems to yield better to a treatment of arsphenamin than any other method. The reports, however, are not all favorable, and some of them have not had favorable results in its use. It would seem, however, that until more definite information is had on this subject that it is a rational method of treating the disease. WEIL'S DISEASE, epidemic jaundice, due to the *Leptospira icterohemorrhagiæ*, and about which I have commented considerably in previous numbers of PROGRESSIVE MEDICINE, unfortunately does not seem to be affected by the use of arsphenamin.

YELLOW FEVER; a full account of Noguchi's findings will be found under the heading of this disease. In a personal communication to Reasoner and Nichols, Noguchi states that the organism may be destroyed by a 1:200,000 solution of arsphenamin after two or three days' contact *in vitro*, but in his work with susceptible animals does not seem to have any beneficial effect upon the course of the disease. Whether it will have any good effect in man or not will have to be determined later, but it is highly probable that it will not, although Arago, reviewing various South American reports, stated that those who have tried it obtained good results.

DENGUE AND PAPPATACI. These both resemble yellow fever, but are much less severe. There do not seem to be any reports regarding the treatment of these diseases with the arsenic derivatives, but one would expect the negative results that obtain in yellow fever. Craig believes that all three diseases are due to closely related organisms, so that observations of this nature will be awaited with great interest.

YAWS OR FRAMBESIA. This disease of the tropical regions of Asia, Africa, America and Australia is due to an organism resembling that of syphilis very closely. Practically all observers believe that arsphen-

<sup>12</sup> Archives of Internal Medicine, April 15, 1920, p. 429.

amin or neosalvarsan is the best treatment and indeed it is more satisfactory in yaws than in any other disease, it being possible to completely sterilize the patient as far as the spirochetal infection is concerned with a single dose. There are no dissenting opinions.

**GANGOSA.** This is an ulcerative and destructive process similar to the granulomas and usually affects the nasopharyngeal tissues, ending in complete destruction of the nose and the pharyngeal vault. The disease is found in the West Indies, Africa, Guam, Australia and other tropical countries and it is said to yield almost miraculous improvement in the course of twenty-four hours after the administration of arsphenamin.

**VERRUCA PERUANO.** This disease has been confused with yaws, but Strong, who has studied it believes it is a distinct disease, as I have noted in *PROGRESSIVE MEDICINE* in past years. The disease is found on the west slope of the Andes. The use of arsphenamin is not attended with favorable results.

The lower animals are also affected with spirochetal diseases, among them being *EQUINE INFLUENZA* due to an unknown filtrable virus. Various observers have claimed to have obtained good results by the injection of arsphenamin intravenously at the rate of 0.01 grams per kilogram of body weight. The drug has also been used in the spirochetosis of fowls, many of which are cured, but some are very resistant.

The protozoal diseases have been treated with arsphenamin with varying results, on the whole, not as favorable as those obtained in most of the spirochetal infections. It has been used in *MALARIA*, but its advocates are not very enthusiastic about it and the probabilities are that it has comparatively little influence on the course of the disease.

On the various diseases caused by trypanosomes, the effect is somewhat variable, and the results of various observers are by no means in accord.

The *SLEEPING SICKNESS* of man and *SURRA* of horses, camels and cattle are apparently but little affected by the use of arsphenamin, but in both diseases there have been some favorable reports.

In *DOURINE*, which affects stallions, brood mares and donkeys, the *MAL DE CADERAS* of horses and *NAGANA* of horses and cattle, good results have been claimed, although they are not what might be wished considering the effect of the drug on some of the other diseases.

As to the effect of the drug in the *LEISHMANIA INFECTIONS*, further study is needed, the statement at the present time being made that the course of the disease is influenced favorably, but cures are not obtained by its use. Inasmuch as there are other methods of treating those diseases so far superior, arsphenamin will probably be discarded in the long run.

Of the various other diseases the drug has been used in various complications of syphilis, such as pneumonias with delayed resolution, secondary infections and anemias with some good results. The drug has been tried, but apparently has little or no influence in glanders, sporotrichosis, sprue, leprosy, Malta fever, influenza, meningitis, typhus fever, pellagra, plague, rabies, various pyogenic infections and pul-

monary tuberculosis. Favorable reports have been made in chronic pemphigus and there have also been some favorable reports in amebic dysentery and also in anthrax.

**Methods of Treating Anthrax.** Anthrax continually has a certain amount of interest for us, inasmuch as a pretty fair proportion of cases still occur, chiefly among those handling imported hair or hides and also, curiously enough, from the use of new shaving brushes. A lesson in the latter case is obvious as every new shaving brush should be thoroughly sterilized before being put to use. Scholl<sup>13</sup> has made a review of 51 cases treated at the Massachusetts General Hospital from 1888 to 1919. There were 7 deaths in the series, a percentage of 13.7, a remarkable showing considering the severity of the disease. The contrast between the cases treated surgically and non-surgically was remarkable. In 9 cases treated surgically there were 4 deaths, a percentage of 44, while in 42 treated non-surgically there were only 3 deaths, a mortality of 7 per cent.

Bacteriologic examinations of all suspected lesions should be made early, as the disease is frequently mistaken for cellulitis or even carbuncle. After the crusting over of the lesion, it is necessary to elevate the cutaneous edge and probe between the crust and skin in order to find suitable material for examination. In Scholl's series of 51 cases, the anthrax bacillus was found in 41; in 2 cases negative results were obtained, and in 9 no record of the bacillus was made.

The average duration of the disease in the patients that recovered was twenty-three days, while death in the 7 cases occurred on an average of four days after the onset of the disease. Operation upon anthrax lesions, certainly with the present-day methods, is not to be advised, although a certain number of cases will recover after the excision of the lesion.

The treatment used was to put the patient to bed, and, if the location of the lesion permitted, the infected area was splinted and elevated. A light diet was given, fluids being forced to the maximum. In the earlier cases the infected areas were covered with dry gauze or bichlorid poultices, but for the last three years it was found that the cases cleared up more rapidly and the patients were more comfortable when no dressing was used and the lesion was exposed to the air.

There has been a considerable difference of opinion regarding anthrax. Some have believed it to be a local infection and so most of the textbooks on surgery advise the surgical removal of the lesion. Hiss and Zinsser believe that while the bacilli are not demonstrable in the blood until just before death, they invade the blood and lymph streams immediately after inoculation and in animals, at any rate, the progress of the disease cannot be stopped by amputation of the tails or ears even when this is done immediately after inoculation. One of the older observations is of very considerable interest, that by Muskett in 1888. He demonstrated by laboratory experiments that ipecac readily destroyed the anthrax bacillus, and cites 50 cases successfully treated by

<sup>13</sup> Journal of the American Medical Association, May 22, 1920, p. 1441.



applying powdered ipecac to the lesion. Numerous other methods of treatment have been suggested. Fortineau found an antagonistic action between the *Bacillus pyocyaneus* and the anthrax bacillus and reports successful results in 31 of 32 patients treated by injection of an extract from a culture of *Bacillus pyocyaneus*. Injections of phenol at the site of the wound have also been highly praised.

Scholl reports the use of anthrax serum in only 1 case. The temperature had remained at 103° F. for five days and dropped immediately after the first injection and remained normal. The serum treatment, apparently but rarely used in this country, had an extensive use in France and Italy and one of the reports of cases treated by Scavo of 164 cases has a mortality of only 6.09 per cent. which contrasts most favorably with the usual rate of 12 per cent. that is ordinarily reported from the Italian clinics. Krause has made a number of reports in recent years on the use of normal serum in the treatment of anthrax. From 30 to 50 c.c. are injected daily, either subcutaneously or intravenously. In a series of 200 cases there was a mortality of 0.5 per cent.

Symmers,<sup>14</sup> Director of Laboratories at Bellevue Hospital, reports that within the past few years some 15 cases have been treated with serum. The results were gratifying, all those coming under treatment early being speedily cured. The change for the better takes place within forty-eight hours and complete recovery within a week or ten days. The method of treatment followed was to give 40 c.c. of the serum prepared by the Department of Agriculture at Washington, intravenously every four hours and at the same intervals to inject some 10 c.c. into the skin surrounding the pustule. This latter procedure was suggested by Regan, an observer with an original way of thinking. Serum sickness is a very common sequel, but, as a rule, does not interfere with the progress of the case. The septicemic cases all died.

Results of treatment are very well shown in the number of cases and deaths as reported in New York City.

Year.	Cases.	Deaths.
1915 . . . . .	13	9
1916 . . . . .	4	3
1917 . . . . .	16	9
1918 . . . . .	15	4
1919 . . . . .	14	9
1920 (first 6 mos.) . . . . .	12	1

Taken all in all, the non-surgical treatment seems to offer the best outcome, as operations in or about the wound open up the lymph spaces and so allow the infection to spread more rapidly. Lesions on the face and neck, and especially the latter, are apt to be unusually severe.

**The Dangers of Ascariasis.** From time to time there have been reports showing the danger of infection with the ascaris, which is a parasite ordinarily regarded both by laity and physicians as relatively harmless.

<sup>14</sup> Weekly Bulletin of the Department of Health, City of New York, August 7, 1920, p. 249.

An article showing the contrary has been contributed by Crowell.<sup>15</sup> He has shown as, of course, was well known before, that these worms may cause symptoms and even death through toxic reflexes and mechanical effects, either while in the larval stage or in the adult stage or in the course of their migrations through the body. He has reported an unusual number of remarkable instances and states that these are only a portion of those that have been observed by him. Crowell makes out a pretty strong case against the ascaris which is a very common parasite in the warm climates. His experience was gotten chiefly in the Philippine Islands and some idea of its incidence there may be gained by the figures of Willets who, in 1911, found 62.3 per cent. of 4278 persons infested with ascaris as compared with 54.37 per cent. with hookworm, and, in a grand total of 19,302 examinations, 61.36 per cent. had ascaris and 30.57 per cent. had hookworm. In some of the series from which these statistics were compiled, the percentage of ascariasis infections was as high as 83. In 500 consecutive autopsies on cases, the majority of which came from a hospital in which routine treatment for intestinal parasites was practised, Crowell and Hammack found 41.2 per cent. of ascaris as compared with 16.6 with hookworm. In other places the incidence of the ascaris runs up to almost 100 per cent.

In previous numbers of *PROGRESSIVE MEDICINE* I have called attention to the dangers of the ascaris. Crowell divides their evil effects into four groups: (1) Mechanical effects; (2) as a carrier of infection the worm is of importance; (3) the larvæ cause bronchopneumonia in experimental animals and it is not impossible that they may do so in infants; and (4) the presence of harmful toxic substance is a source of danger.

The mechanical effects may be due to the large number of worms present. Crowell reports 200 found in the intestine of one child and numbers such as 75 to 100 were so frequent as to cause no surprise. His numbers were under those of other observers, as Fauconneau-Dufresne relates a case in which 600 were evacuated in one day alone. These masses may give rise to constipation and also to complete obstruction. Large masses of worms may also be mistaken for abdominal tumors, and Crowell states that this is a frequent source of error to newly arrived physicians in the tropics and relates that he has even seen the abdomen opened under this false diagnosis, and that the use of vermifuges causes the indefinite postponement of many operations.

The worms are not infrequently found in the peritoneal cavity on autopsy, but there is a question as to whether they perforate the intact wall. Some maintain that it cannot, but others believe that the worm simply makes use of an opening made in another manner or that the perforations are caused by gangrene from pressure of the parasites. The worms have a tendency to enter small orifices. This is frequently emphasized and Blanchard refers to the fact of the worms engaging themselves in the holes of buttons that have been swallowed and states that certain authors have even proposed objects of this kind as worm snares.

<sup>15</sup> American Journal of the Medical Sciences, March, 1920, p. 380.

Crowell relates an instance in which a full-grown worm had penetrated through the tunnel in the submucosa, connecting two adjacent tuberculous ulcers of the colon, and was found protruding from both ulcers and doubled on itself so as to form a knot. He also relates the frequently quoted case of Clason, who reported that in the case of an idiot who had swallowed glass beads, the ascaris showed a predilection for sticking in the beads and were passed threaded in this manner. There have been numbers of cases in which the worm was found in the appendix and it is highly probable that symptoms may be produced by the worm entering or attempting to enter the appendix. While symptoms simulating appendicitis may be caused by the ascaris in the appendix, it may also be present without causing any changes or symptoms. Crowell also relates several cases in which the ascaris had actively opened up a repaired wound of the intestine, causing a fatal peritonitis, and it is emphasized that a routine examination of feces should be made in all cases, and a vermifuge administered if the ascaris is found.

The worm may migrate and not infrequently enters the common duct and goes into the gall-bladder or into the intrahepatic ducts, and one or more worms in the common duct may be the cause of obstruction which may be followed by icterus or symptoms of colic, and which may lead to the development of a cholangitis and later abscesses of the liver.

Leer states that ascarides are the second most frequent cause of liver abscesses. Crowell relates an instance in a Filipino child of four years of age who was given home treatment and about one week later was taken suddenly with jaundice and sweating. Five hours later the child died while the father was off looking for a physician. There was edema of the larynx, large numbers of ascarides in the bowel and the bile ducts were distended with five large worms which extended into the hepatic ducts. There were numerous parasites in the stomach and six large ones in the esophagus. The sudden death was supposed to be due either to a reflex nervous phenomenon from intestinal and biliary ascariasis, or, what seems more probable, from asphyxia from ascarides in the upper respiratory tract.

In another instance the worms in the common bile ducts were accompanied with thrombosis of the splenic vein and hemorrhagic pancreatitis. Crowell gives numerous instances of the ascaris in the bile ducts with the formation of liver abscesses in which death was caused in various ways. Migration to the pancreas is another form of migration. If the worms pass into the ducts of Wirsung during life, the result is either the formation of hemorrhagic pancreatitis or abscesses, and, as remarked above, it also seems probable that the ascaris in the bile duct may lead to an acute hemorrhagic pancreatitis without the entrance of the worm into the ducts of Wirsung. In some instances the worms were found in the duct without any lesion, in which case they have been regarded as probable postmortem migration.

The migration of the ascaris to the stomach and esophagus and from thence to the mouth or nose is extremely frequent, and if fistulous tracts are found on the way the worm may reach unusual places. They also



pass into the accessory nasal sinuses, the antrum, lacrimal duct, Eustachian tube and external ear or into the larynx and trachea. There are instances on record in which the removal of the worm from the larynx or trachea has led to the disappearance of alarming symptoms. Crowell calls attention to the fact that one should be slow to ascribe death to a worm in the larynx or trachea at postmortem, as it might have reached this situation after death. If there was a history of respiratory difficulty, the inference would be otherwise.

The ascaris as a carrier of infection is a danger. Peritoneal abscesses in the liver, as mentioned above, all bear witness to this. Stewart<sup>16</sup> and Ransom and Foster<sup>17</sup> have studied the life history of the ascaris in experimental animals and found that a bronchopneumonia may develop and may even prove fatal if the infection is massive. This has been noted in the pig, mouse, rat and guinea-pig. Crowell states that they quote the case of human experimental infection reported by Lutz in which there was the occurrence of a severe bronchopneumonia in the subject of the experiment during the incubation period, and it seems not improbable that in some cases in infants and children the inflammation of the lung may be due to this cause.

The toxic and reflex nervous symptoms from the ascaris is a more difficult subject. All sorts of things have been ascribed to worms, from the popular picking of the nose and capricious appetite to fevers, nausea, flatulence, abdominal pains, convulsions, tetany, symptoms of chorea, hysteria, epilepsy, psychic disturbances, symptoms suggesting meningitis, all of which disappear after successful treatment. Various studies have been made to determine the cause of these symptoms. Flury, in 1912, demonstrated the volatile aldehydes of fatty acids as well as certain other acids. He believes that the worm produces not a single poison, but a number of active substances which may produce at times different and very severe symptoms.

The various disturbances of the central nervous system attributed to the ascaris, such as psychic disturbances, hysteria, epilepsy and the like, might thus be explained on a basis of chronic aldehyde poisoning. Shimamura and Fujii isolated a toxic substance from the horse ascaris which they have given the name askaron. This consists of a mixture of albumoses and peptone and injected subcutaneously and intravenously into the horse produced toxic symptoms.

As a result of his studies and after reading his article, one is inclined to believe Crowell, who is of the opinion that the dangers of the ascaris is liable to be underestimated and he is also of the opinion that if there is any question of doubt, suitable treatment should be instituted before undertaking surgical procedures, not only because the need for operation may be removed, but because of the accidents due to the migratory proclivities of the worm fatal complications may follow some surgical procedures that would otherwise terminate in complete recovery.

**The Snail as the Intermediate Host of Bilharzia.** A very important discovery in reference to the causation of bilharzia has been made by

<sup>16</sup> British Medical Journal, 1919, p. 102.

<sup>17</sup> Journal of Agricultural Research, 1917, xi, 395.

Leiper,<sup>18</sup> helminthologist of the London School of Tropical Medicine. He suspected that the worm entered the human host by puncturing the skin of the legs during bathing, but how the worm got into the water in the first instance is not definitely known. Leiper collected and dissected large numbers of fresh-water mollusks and finally found the bilharzia in the snail, but all of this type were not infected; only those taken from certain localities. He also observed, in the neighborhoods where the bilharzia was found, that rats and mice were very infrequent, so much so, in fact, that none could be captured in these regions. Animals were obtained from other places and exposed to infection, and it was later found, in addition to tame rats and mice, that the desert rat from the pyramids and a species of monkey could be infected. It was also shown that bathing in the water or drinking it was dangerous in the highest degree. The eggs of the worm, on leaving the human host, entered the bodies of the snails and underwent development there. Six weeks later they leave the snail as small, free-swimming animalcules known as cercaria. These have a spike on their body with which they pierce the skin of their human host and so enter the blood. Cairo has an excellent and well-filtered water supply, but Leiper discovered, in addition, there was a second system carrying unfiltered water drawn directly from the Nile which was used in numerous gardens. Whether it is possible to eradicate the snails, which would require the draining of the canals and reservoirs, remains a problem to deal with in the future.

**Botulism.** Last year I commented on the subject of botulism from canned asparagus. This disease will doubtless continue to be reported in ever-increasing numbers for several reasons. In the first place the preservation of foods for human consumption has increased very greatly during recent years, partly due to necessity and partly due to government propaganda on this subject. Many individuals unqualified to prepare food in this manner have been led to experiment with it, either for their own use or for sale. The coming years will probably see a great diminution in the actual amount of food, which will lead to the salvaging of a great deal that is partly spoiled, and the ever-increasing carelessness and lack of desire to do things in the proper manner will do the rest.

Anyone interested in the subject of botulism should refer to Dickson's monograph, No. 8, Rockefeller Institute for Medical Research. Some idea of the number of deaths from food poisoning can be gleaned by the number of cases recorded in the registration area of the United States from 1910 to 1916. There were 3916 deaths reported, which gives an estimate of 874 deaths annually. Inasmuch as the diagnosis is frequently not made or the death reported under some other name, it may be assumed that the number of deaths occurring in the United States far exceeds this number, and the damage is not only confined to the human animal, but to horses and mules and other domestic animals as well.

<sup>18</sup> Journal of the American Medical Association, September 11, 1920, p. 761.

The most interesting of the recent reports is where the disease was due to eating ripe olives. A remarkable instance occurred at a country club near Canton, Ohio. There were present at what is termed a "banquet" about 200 people. Following the dinner 14 cases of poisoning occurred, 11 among the guests and 3 among the employés at the club. Five guests and 2 employés died. The guests who became ill were all members of a party given by a lady of Sebring, Ohio. This party had been served at a separate table and the servants who were affected were the chef and two waiters who attended this table. A full account of this disastrous event is given by Armstrong, Story and Scott.<sup>19</sup> It will not be necessary to follow in detail the studies that have been made to determine which food was responsible. It is interesting, however, that the taste, odor and consistency of the ripe olives served received more or less comment during and following the dinner. Of the 14 persons who were ill, all ate olives, and 3 others had tasted them and used the expressions "just bit into one," or "took a small bite." None of these suffered any bad effects. One, however, stated that she felt badly on the day following the banquet. In a general way it was found that those who died first ate the most olives. Armstrong, Story and Scott have made a careful study of the organisms obtained and also give an account of the symptomatology and pathology.

Another report on this same subject is by Sisco.<sup>20</sup> The outbreak reported by him occurred in January, 1920, in an Italian family in the Bronx, New York City, and the source of the disease was found to be a glass jar of factory-packed California ripe olives. There were 8 members in the family; 7 of them who partook of the olives died. One child who developed no symptoms insisted that she ate one whole olive. She was given two intravenous injections of 15 c.c. each, about twelve hours apart, of an antitoxin received from the Bureau of Animal Industry, at Washington, D. C. A single injection was given to another child as a prophylactic measure and there was some uncertainty at the time as to whether he had taken any of the olives or not. The antitoxin was not available until 4 patients were dead and 1 other was so far gone that he was past aid. One patient who exhibited definite symptoms was given the serum, but died three hours later.

A preliminary report on the antitoxin has been made by Dickson and Howitt.<sup>21</sup> They conclude that a true antitoxin may be prepared for the *Bacillus botulinus* and that there are at least two types of the *Bacillus botulinus* that are distinct so far as their toxin-antitoxin relationships are concerned. Laboratory experiments show that in the laboratory the antitoxin may protect against the action of the toxin for at least twenty-four hours after the administration of one test dose of toxin, but that the effectiveness is, to a certain extent at least, dependent on the amount of toxin injected. They suggest for therapeutic administration a polyvalent antitoxin should be employed, and it should be given intravenously in large amounts.

<sup>19</sup> Public Health Reports, December 19, 1919, p. 2877.

<sup>20</sup> Journal of the American Medical Association, February 21, 1920, p. 516.

<sup>21</sup> Ibid., March 13, 1920, p. 718.



The effect of an antitoxin in this disease was first demonstrated by Kempner in 1897. He succeeded in immunizing goats and obtained an antitoxin, 1 c.c. of which would protect against 100,000 minimal lethal doses for guinea-pigs. Forssman and Lundstrom immunized rabbits and guinea-pigs and also goats, while Wassermann and Leuchs both immunized horses. In this country, Graham, Brueckner and Pontius<sup>22</sup> prepared an antitoxin by injecting goats and cattle from strains which they isolated in an outbreak of forage poisoning occurring in horses; and Buckley, at the United States Department of Agriculture, has immunized horses to strains of the organism obtained from asparagus poisoning; while Meyer, Hurwitz and Taussig have immunized dogs. Burke reports the immunization of rabbits.

There has been very little published concerning the therapy and prophylactic use of this antitoxin. The antitoxin has not been placed on the market commercially and can only be obtained from the various laboratories in which the effects are being studied. Dickson used a subcutaneous injection of immune goat serum in two patients, both of whom recovered, but inasmuch as the antitoxin was given very late it was not clear whether the favorable outcome was due to it or not.

MacCaskey<sup>23</sup> has reported giving small doses to three patients who were poisoned by home-canned string beans. One of the patients died and 2 recovered, and the reporter believes that the serum was of some value. Jennings, Haass and Jennings<sup>24</sup> injected 42 c.c. of serum intravenously into one patient without any apparent effect, and 20 c.c. in two injections into another patient who recovered. The disease in the second patient was very mild and the effect of the antitoxin questionable.

With the increase in the number of cases, it may confidently be expected that a potent antitoxin may be available commercially. The effect in human beings, as well as in animals, will probably be determined with considerable accuracy in the next few years. The danger of eating ripe olives perhaps might be properly made the subject of another constitutional amendment.

**The Common Origin of Chicken-pox and Certain Cases of Herpes.** I commented in *PROGRESSIVE MEDICINE* last year on the curious observations that have been made by various individuals on the possibility of these two diseases having a common origin. A recent report on the same subject is made by Netter,<sup>25</sup> an observer whose observations deserve considerable attention. He states that these effects have been ignored both by dermatologists and pediatricists with the few exceptions of those making reports. Netter has collected 59 instances from various observers of varicella following herpes. These were taken from the journals from 1909 to 1920 and include observations made in Hungary, Austria, Germany, France and Great Britain. These reports were made by over thirty observers, including Bokay, Bruce,

<sup>22</sup> *Journal of Bacteriology*, January, 1919, p. 1.

<sup>23</sup> *American Journal of the Medical Sciences*, July, 1919, p. 57.

<sup>24</sup> *Journal of the American Medical Association*, January 10, 1920, p. 77.

<sup>25</sup> *Bulletin de l'Académie de Médecine*, June 29, 1920, p. 588.

Parkes Weber, Fordyce, Feer and other well-known clinicians. He gives 10 cases in which varicella preceded the herpes.

Netter reports two instances of his own and quotes one from Feer<sup>25</sup> in which of the three instances in circumstances well controlled there were one or more cases of varicella with the usual period of incubation, then a case of herpes and at the proper length of time following the case of herpes one or more cases of varicella. Between the appearance of the herpes and the varicella the interval was fourteen and seventeen days for the first series, fifteen days for the second and thirteen and sixteen days for the third. There was no other plausible explanation for the appearance of the varicella. Taking the various observations together, the interval between the contact of the subject suffering with herpes and varicella is as follows:

3	times in	8	days
5	"	10	"
1	"	12	"
4	"	13	"
27	"	14	"
8	"	15	"
9	"	16	"

8	times in	17	days
3	"	18	"
2	"	19	"
3	"	20	"
3	"	21	"
1	"	23	"

The seat of the herpes eruption was as follows: three times in the trigeminal area with three ophthalmic herpes; twice in the occipital region; six times in the cervical region; five times on the arms; thirty-three times on the thoracic region; five times in the lumbo-abdominal region and six times on the legs.

When the varicella follows the herpes they may occur the same day, as in three instances reported by Corlett and Parkes Weber; the next day in 2 cases and the third day 1 case; the fourth day 5 cases, and 1 each on the fifth, seventh and twelfth days. It is a well-known fact that in the course of herpes there may be scattered vesicles which were first described by Teunneson in his *Traité de Dermatologie*. There is some difference of opinion regarding the frequency with which these vesicles occur and also as to their significance.

In a discussion of Netter's paper, Pierre Marie expressed the belief that they had merely to do with the sensory nerve fibers and were not due to varicella. He added that he had hundreds of cases of herpes in his cases and had never observed a case of varicella to follow.

The small number of subjects taking varicella after having been exposed to herpes, Netter explains on the ground that the larger proportion of such individuals are immune to varicella by having had it previously. He emphasizes the point that he does not believe that varicella is the cause of all cases of herpes, even of the infectious variety and that such an eruption may follow alterations in the intervertebral ganglia due to various infections. This whole subject is one of extreme interest and further observations will probably do much to clear up the responsibility between the two diseases, in case there is any.

Ker,<sup>27</sup> whose opinions concerning the acute exanthemata are

<sup>25</sup> Schweitzer Medizinische Wochenschrift, January 15, 1920.

<sup>27</sup> The Lancet, August 14, 1920, p. 347.

worthy of the closest attention, has an article on the same subject in which he calls attention to a number of interesting points, among them the abnormal distribution of the chicken-pox eruption which may be determined by local pressure or irritation on any part of the body, sometimes in areas where under ordinary conditions the pocks may confidently be expected to be sparsely scattered. Examples of this are seen after the application of mustard plasters, after the initial fever or at the site of the collar stud, the boot lace or the garter. Hamburger, in Nothnagel's *Spezielle Pathologie und Therapie*, suggested that some of the cases of herpes followed by chicken-pox might have been cases of chicken-pox itself with the eruption determined in its distribution by such a cause as pressure and friction of badly fitting corsets. Ker gives two instances of his own; one in a small girl who developed what appeared to be a typical herpetic patch over the left shoulder-blade. On the following day she had a few out-lying vesicles of varicella. There was at no time anything below the waistline and nothing on the scalp, face or limbs. She was sent to a chicken-pox ward where she did not contract the disease and seventeen days after her removal from home, one of the children who had been exposed developed chicken-pox.

Ker also comments on the association of chicken-pox and herpes zoster, and records 4 cases of his own in which herpes was followed by the development of chicken-pox. He believes that the small number of cases of chicken-pox followed by herpes may readily be explained by coincidence and he believes that cases of herpes followed by chicken-pox, as long as they remain unexplained, are deserving of the most careful attention. He is of the opinion that the key to the mystery lies in the hands of the general practitioner and he urges that all cases in which any association of the two conditions is seen be carefully noted and put on record, and he believes it is equally as important to keep a note of all cases of herpes which occur in a family where there are susceptible children and are not followed by chicken-pox. Ker is of the opinion that one hundred general practitioners willing to note such facts for a period of three or four years could clear up the question satisfactorily.

**Vaccination Against Cholera.** The wonderful success that has attended the use of antityphoid vaccine is so well known that practically all well-informed laymen are familiar with it. The success that has attended the use of vaccinations against cholera is not so well known, although there have been quite a lot of contributions on this subject. It is interesting, therefore, to review the report of Cantacuzene<sup>28</sup> published on the jubilee of Metchnikoff.

Cholera was among the first diseases studied with a view to preventing it by means of a vaccine. In 1884, Ferran, of Barcelona, demonstrated that it was possible to immunize guinea-pigs by injections of the organism. He used injections of living cultures. As so often happens with any new idea, this did not meet with very much approval,

<sup>28</sup> Annales de l'Institut Pasteur, February, 1920, p. 57.



either by the public or the profession, and a pitiless campaign was waged against the experimenter. Four years later, in 1888, Haffkine prepared a vaccine after the methods of Pasteur, that is, the first dose attenuated and the second intensified by passages through laboratory animals. His method was tested on a large scale in India, and both the morbidity and mortality were infinitely less in those vaccinated than in the residents of the same sections who were not. While his experiments were successful, they did not attract much attention because, while used on a large number of individuals, they affected only a small number of villages and made no appreciable influence on the epidemic that prevailed in India, consequently they failed to strike the public imagination. Subsequent attempts were made in Russia some years later, but these results were not striking. While good results were obtained in certain regions, the statistics were often contradictory. From that time there has been a certain amount of research work done by numerous observers whose experiences it is not necessary to detail at this time nor need we go into any very long discussion of the results that have been recently obtained.

The proof of the value of the vaccines was thoroughly tested in the last two Balkan wars and in Roumania. The vaccine used was polyvalent and there entered into its composition some twenty-five strains of vibrions, of which fifteen came from the raging epidemic. The emulsions were heated for an hour and a half at  $55^{\circ}$  to  $56^{\circ}$  C. The vaccine contained between 500 and 1000 billion bacteria per cubic centimeter. Two inoculations of from 2 to 4 c.c. were given at six-day intervals. In certain cases where it seemed possible to extinguish a beginning focus, inoculations were given of from 3 to 5 c.c. Even these large doses were generally well borne without any other accident than the well-known local and general reactions. During the campaign in Bulgaria, 133 successful inoculations of 1, 2 and 3 c.c. were given, but it was soon demonstrated that to obtain prompt results larger doses were indispensable. Cantacuzene believes that the earlier, more or less unsuccessful inoculations used in Russia were due to using doses that were too small. He also found that to revaccinate an individual who had previously been vaccinated twelve months before, one dose of 3 c.c. was sufficient.

Cantacuzene gives nearly a dozen observations, showing how the vaccine acted in stamping out the disease. Only one of these need be cited as more or less characteristic, although I have chosen one of the most striking examples. This was in the campaign of 1913 in a regiment of infantry that had been making forced marches. There were 4500 men in the regiment and it was violently attacked by cholera. At the end of ten days there were 386 cases, with 166 deaths. On the second day all the men received the first injection of 3 c.c. of the vaccine and the second of 5 c.c. six days after the first. In the interval of the two injections the new cases continued to appear without any apparent diminution in the number. Eight days exactly after the first inoculation, that is, two days after the second, the epidemic stopped suddenly and the number of cases fell at once to zero.

Cantacuzene believes that in order to stamp out any focus of the disease it is necessary to use the vaccine generally and without reference to any theoretical objections to using a vaccine in this manner, and he states that the lesson to be learned from the history of anticholera vaccine is that no theory of medicine, however seductive, is worth one good experience. He concludes that the value of the vaccine as a preventive of cholera by means of the heated organisms is certain. There is no method by which an individual can be protected from cholera infection as surely as this, and there is no more certain method of stamping out the disease when it has once secured a foothold. To obtain satisfactory results, the doses must be large, such as those detailed above. As regards the production of the negative phase, he waives all theoretical considerations in view of his practical experience and apparently forgets all about it. He believes that the local immunity of the intestine plays a considerable part in the defence of the organism and immunity seems to be established at this point before it appears in the circulating blood.

**Auto-serum Treatment of Chorea.** The question of chorea is one of great practical interest. As to the nature of it there is some question. We may assume, however, that it is due to organic changes in the nervous system caused by either bacteria or their toxins. It is highly probable that chorea is not really a specific disease, but a manifestation of the changes that may be brought about by more than one organism. Its close association with rheumatism has led to the general belief that the symptoms are a manifestation of that disease as it affects the nervous system. The treatment of the disease has always been more or less unsatisfactory. Rest, isolation, and iron will apparently give as good results as the various specifics that have been recommended, such as the salicylates by some and arsenic by others.

In 1912, A. L. Goodman, of New York, suggested and used a method of treatment which is very simple and which, in his hands, has been very efficacious. For some reason or other, but very few clinicians attempted to make use of it. Gradually, however, it has been tried in various clinics and all who report on it are enthusiastic as to the results. In a word, the treatment consists of withdrawing blood from a vein of the patient and injecting the serum from it after withdrawing fluid from the spinal canal. The technic is as follows, after the description of Brown, of Toronto:

Tuberculosis and syphilis must be excluded, and all drugs avoided for at least five days previous to the injection. This applies to all forms of medication, and especially salicylates. Serious results may follow if this is not done. I should think that the treatment ought to be carried out in a hospital, but in several clinics it has been given in the outpatient department and the patients allowed to return home an hour or two after the injection. The blood is best drawn from the median basilic vein, a blood-pressure band around the arm and inflated about two-thirds of the blood-pressure is best, facilitating the withdrawal and taking the place of the tourniquet ordinarily used. The blood is received into three sterile test-tubes, everything, of course, being most carefully

sterilized and protected. Sterile gauze should be arranged around the tubing in such a manner as to prevent contaminations from falling in. After the blood has clotted, a sterile platinum loop is run down inside to separate the clot from the test-tube, and the tube is then put into a centrifuge for thirty or forty minutes. At the end of that time the serum is drawn up into a sterile pipette, emptied into a test-tube and put in the incubator to keep at the proper temperature for injection. The preparation takes about an hour and a half, and from 50 c.c. of blood 20 to 25 c.c. of serum may be obtained. About this amount of spinal fluid is withdrawn usually, in some clinics always, under general anesthesia. The serum is then injected slowly, giving as much as possible without causing pressure symptoms. When an obstruction to the entrance of the serum is felt, it is time to stop, as more than this will result in vomiting, headache, elevation of temperature, etc. This sense of obstruction cannot be detected unless the child is under an anesthetic. The patients who are allowed to go home are kept under observation for one or two hours and then sent home and put to bed for a week, where they are under the supervision of a visiting nurse. If the improvement becomes stationary at the end of a week, a second injection is given. Following the injection there may be some temperature, a little stiffness of the neck and an increase in the pulse-rate, but these are only transient.

In Brown's series, 77 per cent. were cured, 19 improved and 1 case unimproved. The average number of injections was three, but seven were given one injection, while in one instance as many as five were administered. The average amount of serum employed was 17 c.c.

My personal experience with this method of treatment has been limited to one very severe case of chorea of about six weeks' standing, and was almost the worst, if not the worst, case I have ever observed. The severity of the symptoms was increasing. One injection caused a cessation of the movements in about three days, and the patient was practically entirely well at the end of two weeks and up to the present time, as far as I know, has had no recurrence. The treatment is simple and, with proper technic, ought to be harmless.

It is important to differentiate chorea from other diseases with choreiform movements. Goodman states that in 75 to 80 per cent. of his cases there was cessation of all choreiform movements after one injection and within a week.

**Coccidioidal Granuloma.** This disease is of increasing interest. It was first reported in 1891 by Wernicke in a native of the Argentine Republic. In 1894, Rixford reported the disease in California and the parasite was later studied by Rixford and Gilchrist under the name of *Coccidioides immitis*. In the fourth case, reported in 1904 by Ophuls and Moffitt, the organism was recognized as a mold instead of a protozoan. Up to the present time there have been 44 cases reported, 41 in residents or former residents of California; one originated in Colorado, one in Missouri, and the first in the Argentine. The majority of cases have come out of the San Joaquin Valley in California.

The disease mostly occurs in men and is not confined to any nationality, class or race. While it has affected all classes of society, the



majority have been laborers engaged in irrigation work in lower California.

The forty-fifth case is reported by Lynch<sup>29</sup> in a negro woman admitted to the tuberculosis ward of a hospital in Charleston, South Carolina. The patient was delirious on admission. Her age was given as forty-five and her occupation as household service. She was intensely ill and died two days later, and came to necropsy with a diagnosis of pulmonary tuberculosis. When the lungs were examined there was some doubt as to the real character of the lesions, but the real nature of the lesions were not suspected until the microscopic slides were examined.

In *PROGRESSIVE MEDICINE* for 1917, I gave a review of this disease, which, considering the fact that it has developed in a number of widely separated communities is probably much more widespread than believed and probably many individual cases are passed over as tuberculosis. In all cases in tuberculosis suspects in which the organism cannot be demonstrated, a search should be made for the coccidioides. Sometimes the onset is acute, with fever, but in other cases there is a gradual onset, the patient usually not being able to fix at just what time the illness began. In many instances there are evidences of systemic infection, with the formation of multiple abscesses. In most instances sooner or later the lungs become involved and the physical signs are those which are usually described in the course of pulmonary tuberculosis.

The blood counts usually vary from 9 to 20 thousand with a normal differential count, except for the presence of 3 or 4 per cent. of eosinophiles.

The disease seems to be uniformly fatal, although in many there are remissions varying from weeks to as long as two years. Death takes place any time from a few weeks after the infection to as long as nine years. There is one case on record in which the infection was recognized in the foot and the leg amputated before dissemination had occurred.

**The Etiology of Dengue.** Yellow fever, dengue and pappataci fever have certain features in common and now that Noguchi has discovered what is very likely the cause of yellow fever interest is again aroused in the other two diseases, concerning which a considerable amount of work has been accomplished and in the light of Noguchi's investigations much more may be hoped for. Craig<sup>30</sup> has given an account of the various researches that have been made up to the present time. Dengue fever, like pappataci fever, is largely of importance through its influence on soldiers. It incapacitates, but rarely kills. The disease occurs in various places through the South and is said to be epidemic at present in Alabama. The idea that it is transmitted by the mosquito had been suggested, but it remained for Graham<sup>31</sup> to present experimental evidence of this which he did in 1903. Graham's work was done in Syria, and he showed that the disease was transmitted by *Culex fatigans*. Graham believed that he had discovered an organism in fresh prepara-

<sup>29</sup> Southern Medical Journal, April, 1920, p. 246.

<sup>30</sup> Journal of the American Medical Association, October 30, 1920, p. 1171.

<sup>31</sup> Journal of Tropical Medicine, 1903, vi, 209.

tions of blood but this has never been confirmed. This, as he described it, was a plasmodium found within the red blood corpuscles and unpigmented. When first seen it is a small dot or rod, actively motile and gradually increasing in size until the entire cell is filled which may then rupture and set free the parasites in the blood. He also believed that he found the spores of this parasite in the salivary glands of the mosquito forty-eight hours after they had bitten dengue patients. He claims to have produced a case of dengue by subcutaneous inoculation of a healthy man with a mixture of salivary glands of a mosquito that had bitten a dengue patient twenty-four hours before.

These researches were followed by some observations by Bancroft,<sup>32</sup> in 1908. He used the yellow fever mosquito, *Stegomyia fasciata*. These mosquitoes were infected by allowing them to feed on patients suffering with the disease and they were then allowed to bite five healthy volunteers, two of whom developed typical dengue fever. He was unable to confirm the work of Graham as regards the presence of a parasite in the blood.

These observations were followed by some studies made in the Philippines by Ashburn and Craig.<sup>33</sup> They showed that the cause of dengue fever is present in the peripheral blood and that the injection of such blood intravenously produces the disease. They also demonstrated that the virus is filtrable and that the disease is not contagious in the ordinary sense of the word. They also brought forward evidence to show that the disease is transmitted by *Culex fatigans*, but they were unable to demonstrate any organism in the blood, either microscopically or culturally. They also showed that the average period of incubation when the disease is produced by the intravenous injection of blood was from three and a half to four days. They were able to demonstrate that there were certain individuals who are immune to the disease.

More recently, Cleland, Bradley and McDonald<sup>34</sup> published two articles in which they confirm the work of Ashburn and Craig as regards the transmission of the disease by injections of infective blood, and the observations of Bancroft as regards its transmission by the yellow fever mosquito, *Stegomyia fasciata*. They also showed that the virus was present in the blood serum and in washed blood corpuscles and that it is resistant to external conditions for several days.

Craig believes that the parasite of dengue is closely related to that causing yellow fever, an opinion common to all students of both diseases. In 1906, in connection with Ashburn, he tried to find this spirochete, but was unable to so do. Since then, however, the technic of direct field illumination has been greatly improved, and Noguchi has devised an anaërobic culture method for the spirochete and improved the methods used in animal observations. It would seem that the discovery of the parasite causing dengue ought to be but a matter of careful observation, using the same methods employed by Noguchi in his studies on yellow fever.

<sup>32</sup> Australasian Medical Gazette, 1906, xxv, 17.

<sup>33</sup> Journal of Infectious Diseases, 1907, iv, 440.

<sup>34</sup> Medical Journal of Australia, 1916, iv, 204, and Journal of Hygiene, 1917-1918, xvi, 367.

**The Virulence of Diphtheria Bacilli from Diphtheria Patients and from Carriers.** We may hope eventually to have solved the vexing problem of how long to confine those individuals who harbor diphtheria bacilli in their mouths and throats. We may also hope to have some simple test by which the virulence can be determined. At present, however, the only sure method is to test the virulence of the organism by animal inoculation. Wadsworth<sup>35</sup> has studied the results of 548 tests. It was found that 90 per cent. that were isolated from cases of clinical diphtheria, from the day of onset to and including one year after the onset, were virulent for guinea-pigs. Eighty per cent. of the strains isolated from a smaller series of healthy contact carriers who acquired the bacilli during epidemics were virulent, while only 10 per cent. of the strains isolated from non-contact carriers were virulent. Ninety per cent. of the cultures that were obtained from convalescent patients during the first three months after the onset of the disease and from contact carriers were virulent. After a certain length of time it was found that it was possible to avoid a large part of the work by not examining convalescent and contact carriers during the first three months after the onset of the disease. It would seem that the carriers, either those who had diphtheria or contacts with cases, harbor diphtheria bacilli which in the first three months may be considered virulent, and Wadsworth believes that the three month rule for testing the virulence is a wise one, as changes in virulence and changes in the species of strains takes place very slowly in the throat under ordinary conditions.

**The Schick Test.** Blum<sup>36</sup> gives the experience in the Home for Hebrew Infants during the past five years. It is an especially interesting contribution inasmuch as the same children were observed and retested over about this period, and also because the age of the children coincides with the most frequent age incidence of diphtheria. His results are similar to those of other workers and he demonstrated conclusively, if any further proof were needed, that the Schick test is a reliable one.

Tests were made on 1076 children and showed that when a negative Schick test was obtained, the individual possesses sufficient antitoxin in the tissues to protect him against a diphtheria infection. Those tests, which were faintly positive, possibly mean that there is sufficient antitoxin, whereas those that were mildly positive show an insufficient amount. These individuals were probably ones who became carriers when infected with virulent organisms, or if they developed the disease at all, suffered only from a superficial infection and showed no constitutional toxemia.

Tests were made on 72 families and the younger members of the same family usually showed corresponding reactions. When there were variations, the younger members usually gave a positive test and the older ones a negative one. Infections under six months were exceptions to this rule owing to the immunity transmitted from the mother. It was found that there were some changes from negative to positive during the first three years of life, due to the loss of inherited immunity, so

<sup>35</sup> Journal of the American Medical Association, June 12, 1920, p. 1633.

<sup>36</sup> American Journal of Diseases of Children, July, 1920, p. 22.



that Blum suggested retesting during this period every few months, especially in infant asylums, as the length of time the immunity conferred on an individual susceptible to diphtheria by the injection of a toxin-antitoxin has not yet been ascertained.

Blum states that the workers in the Research Laboratory found that immunity once acquired there was a duration of at least four and a half years, and in one series of the cases immunity persisted in 100 per cent. of a group of 50 children for at least twenty-two months. Of course, it will take a passage of time to determine definitely just how long the immunity lasts and what variations there are in different individuals.

Gorter and Huinik<sup>37</sup> have reviewed the subject of active immunization in diphtheria and added their personal experiences, which are in accord with the results given above. They believe that it is better not to inject infants who react positively to tuberculin, and those who are distinctly of the lymphatic diathesis type.

**Postdiphtheritic Paralysis of the Respiratory Muscles.** Extensive paralysis of the respiratory muscles coming on in the occurrence of diphtheria, poliomyelitis, and other diseases in which paralysis is a feature, are very likely to end in suffocation resulting in death. If there are myocardial changes, death from cardiac failure may result. Marriott,<sup>38</sup> among others, suggested that if the respiration can be maintained by artificial means until the respiratory muscles regain their function, death from suffocation may be averted and the danger from cardiac failure lessened. He reports an instance in which a child of ten years of age, in the course of a multiple neuritis, developed a failure of respiration. The diaphragm was paralyzed and ultimately the intercostal muscles and the accessory muscles of respiration became involved. There were no signs of pneumonia or obstruction in the air passages. The apparatus described by Gesell and Erlanger, which is designed to convert a continuous air current into an intermittent one of any desired rate and volume and which has been used extensively in the physiologic laboratories for administering artificial respiration to animals, was used. After a short period the slight coöperation necessary was obtained and air forced into the lungs. The effect was almost immediate. Cyanosis disappeared and the patient became sufficiently conscious to coöperate well. The rate of the machine was adjusted to correspond well with the respiratory efforts of the child and after about ten minutes the child fell asleep and the mask was removed. Cyanosis again appeared and was again relieved by a period of artificial respiration. This was kept up during most of the time that the child was awake for five days. By this time the respiratory muscles had so far regained their function that artificial respiration was necessary only at infrequent intervals.

**Biological Studies of the Diphtheria Bacillus.** Havens<sup>39</sup> has made some observations on this subject and has reached some conclusions of importance in reference to the morphology and virulence of the organisms. He determined that the morphologic characteristics of the diphtheria

<sup>37</sup> Archives de Médecine des Enfants, June, 1920, p. 338.

<sup>38</sup> Journal of the American Medical Association, September 4, 1920, p. 668.

<sup>39</sup> Journal of Infectious Diseases, May, 1920, p. 388.

bacillus showed a tendency to variations from time to time. Instead of placing undue emphasis on morphology, he believes that more attention should be paid to the history of the carrier state, whether a convalescent or a contact with an active case, and he believes that cultures from such individuals should be considered virulent regardless of morphologic characteristics until proved otherwise, because he has found that solid staining types of the bacillus are sometimes virulent and he believes it is much safer to place reliance on the virulence test in dealing with carriers. He has also determined by using the agglutination test two distinct groups of diphtheria bacilli which may be separated and which show no evidence of cross-agglutination, and no difference in morphologic or relative virulence. The results in the agglutination tests have been corroborated by protective tests with antitoxin against the two group toxins, but by these tests the groups are not as sharply differentiated as are the agglutinins.

If these studies are followed up, they may have some bearing upon the production of an even more effective diphtheria antitoxin.

**Toxins and Antitoxins of the *Bacillus Dysenteriae* Shiga.** There have been a very considerable number of studies, most of which were made over ten years ago, on the nature of the toxin of the Shiga dysentery bacillus, so that a contribution on this subject by Olitsky and Kligler<sup>40</sup> is particularly welcome. These observers believe that the chief discrepancies in experimental results and in deductions by the earlier observers may have been due to differences of method in preparing the toxin. After a careful study, they believe that both an endotoxin and exotoxin may be separated from the Shiga dysentery bacillus, and they found that these two toxins are physiologically and biologically distinct. The exotoxin is relatively heat-labile, arises in the early period of growth, and yields an antiexotoxic immune serum. The endotoxin, on the other hand, is heat-stable, is formed in the latter period of growth and is not neutralized by the antiexotoxic serum.

Very interesting observations have been made by the investigators on the action of these two toxins. The exotoxin shows a specific affinity for the central nervous organs in the rabbit, and gives rise to characteristic lesions, hemorrhages, necroses, and possibly a perivascular infiltration into the gray matter of the medulla and the upper spinal cord. On the other hand, the endotoxin exerts a typical action on the intestinal tract, producing edema, hemorrhages, necroses and ulceration, especially in the large intestine. In man, as is well known, the intestinal lesions are usually the most fatal, but in severe epidemics paralysis and neuritis have been observed, a fact which is very significant in view of the discoveries just mentioned.

To be effective in dysentery, an antitoxic serum should contain antibodies against the exotoxin as well as the endotoxin. The authors show that the exotoxin is capable of yielding an exotoxic serum and animals used in observations to which this serum was given, succumbed to the disease with intestinal lesions, but no changes were noted in the nervous

<sup>40</sup> Journal of Experimental Medicine, January 1, 1920, p. 19.

system. Serum prepared at the Rockefeller Institute from horses repeatedly injected with live cultures of the Shiga bacillus, according to the method of Flexner and Amoss, was found to contain not only anti-exotoxigenic, but antienterotoxigenic and other antibacterial antibodies.

**The Importance of the House-fly as a Carrier of *Entameba Histolytica*.** There is very little really known about the transmission of this organism so that Buxton<sup>41</sup> made a study in one small area in Amara, on the lower Tigris. Wenyon and O'Connor have repeatedly shown that one may expect to find the egg of any human intestinal worm, or the cyst of any protozoan in the fly, if only one looks long enough. Buxton found that in this area in the lower Mesopotamia over 60 per cent. of the flies carry human feces, over 4 per cent. of them actual human entozoa, and probably at least 0.5 per cent. the cyst of the *Entameba histolytica*. He believes that one is therefore justified in regarding the fly, at any rate in that part of the world, as an actual and major factor in the carriage of bowel disorders which are unfortunately very numerous.

**Acute Infectious Enteritis with a Polyneuritic Syndrome.** During the summer of 1917 there was a curious epidemic at the State Hospital for Mental Diseases at Howard, Rhode Island, which was studied by Farnell and Harrington.<sup>42</sup> The cases occurred during the interval from July 15 to August 6, and 47 patients and 4 employees were quarantined. There were 20 other individuals whose symptoms were so mild that they were regarded only as suspects and it is possible that these may have been mild or abortive cases of the same disease. All of these made a complete recovery.

The nature of the disease was not suspected at first as the symptoms were irregular, but it was soon apparent that there were acute gastro-intestinal symptoms combined with involvement of the nervous system. In a general way the symptoms were acute gastro-intestinal disturbance characterized by nausea and vomiting and frequent stools containing mucus, sometimes both mucus and blood. The temperature was from 100° to 104° and in many cases there was prostration, together with headache and backache.

The point of particular interest was that the patients presented neuritic symptoms, and showed what was supposed to be a peripheral neuritis involving either the legs or arms and, in some instances, both arms and legs. The affected regions were painful on pressure; in some the pain was very severe, while in others only manifested on pressure over the nerve trunks or muscles. The deep reflexes were usually abolished; there was great weakness, so much so that many of the patients could not walk, although they could stand with assistance.

In 19 cases there were marked gastro-intestinal symptoms, with marked involvement of the nervous system. In a second group of 7 cases the gastro-intestinal symptoms were severe and in 1 fatal, but the involvement of the nervous system, while unmistakably present, showed to a very much less degree than in the group of cases just mentioned. In the third group of 21 cases, there were severe gastro-intestinal disturbance with little or no evidence of peripheral neuritis.

<sup>41</sup> British Medical Journal, January 31, 1920, p. 142.

<sup>42</sup> American Journal of the Medical Sciences, July, 1920, p. 52.



The cases occurring at the start were, in a way, more severe and took a longer time to recover than those later on in the epidemic. The staphylococcus was grown from throat cultures, the blood, feces and urine, and was also found in the milk that was being used, which led Farnell and Harrington to regard the epidemic as a staphylococcus infection first with the acute inflammation of the gastro-intestinal system and a secondary involvement of the nervous system.

**Encephalitis.** Running back as far as the beginning of the history of medicine have been epidemics of various diseases and among others those affecting the nervous system. Readers of Hippocrates will remember the epidemic of paraplegia in Thasus where, in the winter, paraplegia began and attacked many, some of whom died in a short time. Later on in the year there were very severe fevers. Sydenham called attention to the constitution of diseases of epidemics and thought they varied from year to year, an observation which anyone in the practice of medicine has abundant opportunity to confirm. A consideration of just how far back one can go in the history of encephalitis would require more space than we have to give it. Those interested will find a charming account by Crookshank.<sup>43</sup> One may or may not agree with this versatile writer's opinions, but he has gathered together a large number of interesting citations from the earlier writers.

Sydenham described a comatose fever, and Willis one in which there were convulsions. In the sixteenth century what was known as the *Kriebelkrankheit* was described in Germany, which Willis identified as the same disease which he observed later on in England. Crookshank's explanation is that Willis' fever was represented as a convulsive, and Sydenham's as a comatose form of lethargic encephalitis, occurring epidemically. Camerarius described the famous influenza epidemic of 1712 and the term *Schaffkrankheit* was used to describe some sort of a sleeping sickness and subsequently the term was used extensively.

Perhaps one cannot do better in a consideration of encephalitis than to read over the account given by Sydenham of the fever in the years 1673-74-75.

"Among the symptoms of this *Fever* there was one like a *Coma*, wherein the Sick became stupid and delirious, and sometimes he slept for some weeks, and could be roused only by a great noise; whereby being difficultly waked, he would at length open his Eyes, and having taken either a Medicine or Drink, he fell asleep again, which was sometimes so profound, that it ended in loss of Speech.

He that was so affected when he came to himself, began to recover on the twenty-eighth or thirtieth day; the first sign whereof, was the desiring some unusual or absurd kind of Meat or Drink: the Head of the Person that was recovering was weak for some days, and would nod sometimes this way, sometimes that. There were also other signs that shew'd the Head had been much disorder'd; but as the strength returned, this Symptom went off.

Sometimes the Sick did not sleep, so much as rave silently; but he

<sup>43</sup> Boston Medical and Surgical Journal, 1919, clxxxii, 34.

would sometimes speak incongruously, as if he were angry, but the Fury was not so much as is usual when People are lightheaded in the *Small-Pox*, and other *Fevers*; and it was different also on this account, because he slept abruptly betwixt whiles, and snorted much. Moreover, tho this Symptom was not so acute as the other, yet was it more lasting, and it happened most commonly to Children, or to those that were not full grown; whereas that befel grown People chiefly: but in both, if hot Medicines were taken, and Sweats forced the Disease was soon translated to the Head, and the said Symptoms were occasioned.

But when the Symptom neither came of it self, nor was forced by Medicines, the Disease went off most commonly within fourteen days, and sometimes in three or four days, as I have seen sometimes."

Briefly, there have been in the past outbreaks of a disease characterized usually by somnolence and this disease is more or less closely associated with epidemics of influenza. In 1890, epidemics of this kind were described, the best known of which was the one in Southern Europe referred to as *Nona*. There seems to have been some question as to what this name meant, but as Friedenburg<sup>44</sup> has pointed out, it probably came from using a term applied to the lethargic stage of the silk worms. In Italian this form of the word is called *nona* and in French, *nonne*. And now following the recent pandemic of influenza comes a veritable flood of reports of a disease which Barker, Cross and Irwin<sup>45</sup> have written about under a title which might well have been thought out in a lawyer's office: On the Epidemic Acute and Subacute Non-suppurative Inflammation of the Nervous System Prevalent in the United States in 1918-1919; Encephalitis, Encephalomyelitis; Polyneuritis, and Meningo-encephalomyeloneuritis.

The outbreak apparently began in 1917, the first reports being by Economo, who gave the name of encephalitis lethargica. In New South Wales, in the same year, Brinal reported it as the mysterious disease. The following spring an epidemic was reported by Netter under the title of Encéphalite Lethargique Epidémique, and some half dozen other French observers have also written extensively about the occurrence of the disease. In March and April of 1918, the disease appeared in England. A number of studies were made by Wilson, Crookshank and others, as referred to in my review of the last two years. The disease was first believed to be botulism, while others thought that it was an epidemic of some form of poliomyelitis; reports of the appearance of encephalitis have also come from Algiers, and from South America, so that it would seem that the distribution of the virus was very general.

The nature of the disease is still in doubt. Its relation to pandemics of influenza is certainly well borne out by the study of the history of the two diseases and there are some that hold that the virus of the two is the same, although this is merely an opinion that is not supported by definite observations. There are others who believe that the influenzal infection predisposes to encephalitis and there are still others who believe

<sup>44</sup> Journal of the American Medical Association, May 1, 1920, p. 1271.

<sup>45</sup> American Journal of the Medical Sciences, February, 1920, p. 157, and March, 1920, p. 337.

that the cosmic influences, whatever they may be, lead to the development of an epidemic of influenza, and may also be the cause starting one of encephalitis, even though the disease may be due to separate organisms. Most of the writers refer to the disease as a new disease. This, I think, merely argues a lack of knowledge of the history of medicine, as certainly not only encephalitis, but epidemics of it have occurred with very considerable frequency as pointed out above. One of the difficulties in making comparisons of the accounts of the later writers is the difference in terminology and the difference in their concepts of disease. When allowance is made for these factors, the earlier writers can be read with a great deal more satisfaction.

The earlier writers classed under the term encephalitis a great many different diseases, such as meningitis, abscesses and even cerebral softenings. A very good idea of the earlier views may be had by referring to Marshall Hall's *Diseases and Derangements of the Nervous System*, 1841. As Bramwell points out, the various unrelated pathologic processes have been gradually eliminated since Hall's time, chiefly by Virchow, whose work on embolism and thrombosis explained most of the softenings of the brain substance, by the lumbar puncture of Quinke introduced in 1891, and by the work done on the pyogenic diseases of the nervous system, among which may be mentioned that of Macewen.

Of the non-suppurative cases of encephalitis, four groups have been described clinically. In 1881, Wernicke described 3 cases in which there was an ophthalmoplegia, with more or less sudden onset and an acute hemorrhagic inflammation of the gray matter of the third and fourth ventricles and in the neighborhood of the aqueduct of Sylvius. This condition, which has also been called the paralysis of drunkards, is known by Wernicke's name and also as superior poliоencephalitis. In 1880, Vizioli had noted the close relationship of certain cerebral palsies in children to the spinal form of poliomyelitis and the symptom-complex was also described by Pierre-Marie, in France. This type is sometimes known as Strümpell's disease, on account of his contribution which he published in 1884; and Medin, in 1890, called attention to the cerebral palsies that occurred in epidemics of poliomyelitis.

There have been a number of reviews of acute non-suppurative encephalitis; in 1907, by Chartier;<sup>46</sup> by Oppenheim and Cassirer<sup>47</sup> and by Vogt (1912).

There have been not only a large number of contributions dealing with encephalitis, but a large number of general reviews. These have been made by Sainton, Ramond, Netter, Sicard; and among the best is that of Lhermitte.<sup>48</sup> There is also one by Blum. Another review of a very considerable amount of interest is that by Potet.<sup>49</sup> He has reviewed the literature up to June, 1920, and given a résumé of 323 articles. Unfortunately, he omits the references of the authors that he cites.

Epidemic encephalitis is a disease of the nervous system, evidently

<sup>46</sup> *L'Encephalite Aigüe non suppurée* Thèse de Paris, 1907.

<sup>47</sup> *Die Encephalitis* Tauff. Wien., 1907.

<sup>48</sup> *Annales de médecine*, September, 1919.

<sup>49</sup> *Gazette des Hôpitaux*, August 7, 1920, p. 1093.



due to infection with an ultramicroscopic, filtrable organism. Doubtless infection takes place through the nasopharynx. In order to understand the disease, one must bear in mind that any part, or all, of the central nervous system may be involved. The most frequent localization is at the base of the brain, but, as will be seen by what follows, the disease is to be regarded as the same, regardless of its manifold clinical manifestations. For purposes of description, various types have been suggested, but it must be borne in mind that they all shade into one another, so that all degrees of involvement and all sorts of combinations may be observed. While a great many names have been given to the various types, but little confusion has arisen on account of this. Fortunately, the names suggested for the disease in its entirety are few—lethargic encephalitis, mesoencephalitis, epidemic encephalitis, etc. Of these, the last named I think should be adopted in order to secure relative uniformity. Some thirty or forty other names have been applied to various types, as the myoclonic, polyneuritic, etc., but, as a rule, it is plain, from reading the articles, that epidemic encephalitis is the disease in question.

Let us try to get a more definite idea of this protean disease, which has added more to the difficulties of neurologic diagnosis than any other factor in the recent past, even including the ever changing terminology. Perhaps, viewing it from the angles of various authors will give the most satisfactory results.

**ETIOLOGY.** As regards the transmission of encephalitis, there seems to be no difference of opinion that epidemics are spread in some way by the transmission of the disease from case to case. It presents very much the same difficulties in study that were met with in trying to solve the problem of the transmission of poliomyelitis. Netter<sup>50</sup> has made a study of this subject and collected a certain number of instances from which he draws some conclusions which are, I believe, about those held by other observers.

He believes, first, that the disease is certainly contagious, and that it is probably transmitted by means of the saliva. Inasmuch as the virus of the disease persists for a long time in the nervous system, the patient may be the means of transmitting the disease for a long time. He also thinks that there is reason to believe that encephalitis can be transmitted by a convalescent, or that it may be taken from an individual with the disease in one of the abortive or masked forms, or that it may be transmitted by healthy carriers who have been about patients. The disease is certainly feebly contagious and it is very rare to have more than one individual in the same family affected. In the English reports there were six families with 2 or 3 cases, and 359 in which there was only one.

A number of observers have apparently demonstrated that this disease is due to a filtrable virus. Among these are Strauss, Hirschfeld and Loewe,<sup>51</sup> Loewe, Hirschfeld and Strauss,<sup>52</sup> and Loewe and Strauss.<sup>53</sup>

<sup>50</sup> Bulletin de l'Académie de Médecine, April 27, 1920, p. 373.

<sup>51</sup> New York Medical Journal, May 3, 1919, p. 772.

<sup>52</sup> Journal of Infectious Diseases, November, 1919, p. 378.

<sup>53</sup> Journal of the American Medical Association, October 4, 1919, p. 1056, and Ibid., May 15, 1920, p. 1373.

They demonstrated the close relationship of the virus and the micro-organism to the nasopharynx, and found that Berkefeld filtrates of nasopharyngeal washings in cases of epidemic encephalitis produced characteristic lesions when injected intracranially into rabbits. This has also been used as an aid to diagnosis and gave positive results in 78 per cent. of the cases so tested. They were also able to recover, in 11 of 17 nasopharyngeal washings, or 64 per cent., a minute filtrable organism described in their earlier reports. They were also able to produce the disease by inoculation of rabbits with the cerebrospinal fluid of patients, positive results being obtained in 75 per cent., while cultures of cerebrospinal fluid have been positive in 10 out of 20 cases, or 50 per cent. All of the controls gave uniformly negative results.

The bacteriologic studies up to the present time have not yielded any very satisfactory results. Von Wiessner<sup>54</sup> studied one of Economo's cases and isolated a Gram-positive culture from a monkey which had been inoculated subdurally with an emulsion of the brain and cord, cultures of which when injected into a *Macacus rhesus* produced somnolence with muscular weakness. Strauss, Hirschfeld and Loewe<sup>55</sup> claimed to have produced characteristic lesions of encephalitis in monkeys by the use of emulsions of the virus of patients dead of the disease, and stated that they have isolated a Gram-positive organism resembling that described by Flexner and Noguchi in poliomyelitis. The similarity in the lesions in encephalitis, poliomyelitis and trypanosomiasis have been commented on by Neal,<sup>56</sup> Bassoe and Hassin;<sup>57</sup> and by Calhoun.<sup>58</sup>

Somewhat similar bacteriologic findings, as those described by von Wiessner, have been reported by Cohn and Lauber,<sup>59</sup> other reports along the same line are by Bernhardt-Simons,<sup>60</sup> Gröbbels,<sup>61</sup> Loewenthal<sup>62</sup> and Gerstmann.<sup>63</sup> These bacteriologic findings are doubtless either contaminations or may be regarded as complicating organisms.

**PATHOLOGY.** There have been a considerable number of studies made by various observers and these, in the main, agree pretty well. One of the best studies from every standpoint, not only that of pathology, but clinically as well, is that of Economo,<sup>64</sup> mentioned elsewhere in this review. Other studies have been made by Bassoe, and Bassoe and Hassin, Wegforth and Ayer,<sup>65</sup> Neal, Calhoun, Marinesco,<sup>66</sup> and Vaughan.<sup>67</sup> These accounts are, in a general way, all more or less similar. The principal lesions are congestion, edema, petechial hemorrhages, pigmental,

<sup>54</sup> Wiener klinische Wochenschrift, 1917, vol. xxx.

<sup>55</sup> New York Medical Journal, May 3, 1919.

<sup>56</sup> Archives of Neurology and Psychiatry, September, 1919, p. 271.

<sup>57</sup> Ibid., July, 1919, ii, 24.

<sup>58</sup> Ibid., January, 1920, iii, 1.

<sup>59</sup> Münchener medizinische Wochenschrift, June 11, 1920, p. 688.

<sup>60</sup> Neurologie Zentralblatt, 1919, No. 22.

<sup>61</sup> Münchener medizinische Wochenschrift, 1919, No. 5.

<sup>62</sup> Deutsche medizinische Wochenschrift, 1920, No. 11.

<sup>63</sup> Wiener klinische Wochenschrift, 1920, No. 8.

<sup>64</sup> Il Policlinico, Sezione Medica, April, 1920, p. 93.

<sup>65</sup> Journal of the American Medical Association, July 5, 1919, p. 5.

<sup>66</sup> Bulletin de l'Académie de Médecine, Paris, November 5, 1918, p. 411.

<sup>67</sup> Journal of Laboratory and Clinical Medicine, April, 1919, p. 381.

perivascular and diffuse infiltration by lymphocytes, proliferative changes in the endothelial and interstitial tissues and degenerative changes in the nervous cells and sheaths. The entire central nervous system, the meninges included, show changes due to the disease, but the principal site of the greatest changes varies greatly, which accounts for the numerous differences in the clinical findings. The most marked changes are found in the lenticulo-striate complex, the midbrain, the pons and medulla.

**ENCEPHALITIS IN ANIMALS.** Encephalitis has been observed in animals, the cases ordinarily having no relation to the epidemic disease as seen in man. There is a form which is sometimes called Borna disease. It is called by this name because it was described at this town, which is near Leipzig, in 1894. Kraus, Kantor and Quiroga<sup>68</sup> have isolated a diplococcus from the lesions of the disease as it occurs in the Argentine, and have been able to reproduce it in horses and dogs.

**THE CEREBROSPINAL FLUID.** The cerebrospinal fluid may, or may not, be under pressure, is usually perfectly clear and shows no film forms on staining. Sometimes, even in the undoubted cases of the disease, there may be a normal cell count and an absence of globulin. Barker, Irwin and Cross found in their cases, which should be borne in mind, were all mild ones, a cell count of from 10 to 100 small mononuclears, along with a positive globulin reaction, with a negative Wassermann and negative bacterial smears and cultures. A number of observers have noted that a bloody fluid is obtained in lumbar puncture in more cases than would be accounted for in accidental injury to a small blood-vessel, and this is taken to be a manifestation of the hemorrhagic tendency in the disease.

In one or two instances a yellow fluid has been obtained, probably due to hemorrhages into the leptomeninges. The reaction to Fehling's solution is normal. The cerebrospinal fluid is sterile, as a general rule. Various organisms have been isolated, but have usually been regarded as contaminations.

*The Chemical Composition of the Cerebrospinal Fluid.* Marie and Mestrezat<sup>69</sup> found, in comparing the cerebrospinal fluid of a patient with encephalitis and that of a normal individual, that as far as albumin, fibrinogen, chlorides, mineral material and urea were concerned, the findings were approximately the same, and the sugar was considerably augmented. In comparing the same fluid to that found in tuberculous meningitis, they found the following:

Encephalitis lethargica.		Tuberculous meningitis or acute meningitis
Aspect	Limpid	Turbid, more marked, rarely clear.
Albumin	Normal	Augmented.
Chlorides	Normal	Much diminished.
Sugar	Somewhat augmented	Absent or diminished.
Extract	Normal	Augmented with non-meningitis.
Ash	Normal	Lowered in tuberculous meningitis; normal in the other forms.

<sup>68</sup> Revista del Instituto Bacteriologico, Buenos Aires, October, 1919, No. 3, p. 239.

<sup>69</sup> Bulletin de l'Académie de Médecine, February 3, 1920, p. 103.



Dunn and Heagey<sup>70</sup> give their findings in 19 spinal fluids, and collected 64 examination from the literature. The globulin was found positive in over 50 per cent.; the average number of cells in the series was 16 mononuclears per cubic millimeter with variations from no cells to 150. In their personal observations they found that the gold chloride test was mildly luetic in 7 out of 11 examinations. This test is usually negative in encephalitis, but curves of the meningitic type have been noted.

**THE BLOOD.** The blood usually shows a slight leukocytosis, but there may be very considerable variations, from 3000 to over 20,000. The most constant change in the differential count is a slight relative and absolute increase in the polymorphonuclear neutrophilic elements, usually making up from 70 to 90 per cent. total white count.

**THE URINE.** The urine often shows a trace of albumin and a few casts, but changes other than these may be set down to causes other than the encephalitis.

**CLASSIFICATION AND SYMPTOMATOLOGY.** The article by Barker, Cross and Irwin is a short but very clear account of the clinical phenomena of the disease. It must be borne in mind that to understand the numerous manifestations of the disease that apparently any area of the nervous system may be involved and so lead to either a loss, increase or perversion of function. This has led to certain syndromes being described as separate diseases, and, of course, until we have at our hands some means of accurately making the diagnosis, certain cases, the manifestations of which are very much localized, will always remain in doubt.

The onset is, as a rule, gradual; in some instances the disease may come on suddenly. The prodromes are usually weakness, a feeling of lassitude, headache and vomiting. Some patients give a history of having had influenza a few days or weeks before, while others give no history of any influenzal attack whatever. This, however, cannot be taken as evidence that there is not some relationship between the two diseases, inasmuch as during the pandemics practically everybody must have been exposed.

The first symptom complained of is drowsiness, which gave rise to the name of encephalitis lethargica, and the common term, sleeping sickness. The drowsiness varies from slight somnolence sometimes only present at the onset during part of the day, to the deepest kind of coma, particularly at the end of the disease in the fatal cases. None of the patients in Barker, Cross and Irwin's series died, so that evidently they were dealing with the milder forms of the disease. It must be remembered, and particularly in diseases that affect those in early life, that the stupor may be entirely absent and may even be replaced by excitement. In most of the patients the changes in the consciousness amounted to somnolence from which the patient could be roused and made to answer questions, but the deeper forms of coma also occur. In others there is mental depression, sometimes anxiety, and, not infrequently, delirium, either with or without somnolence. Curiously enough,

<sup>70</sup> American Journal of the Medical Sciences, October, 1920, p. 568.

some of the patients complained of insomnia and restlessness at night, while the same patients had drowsiness during the day.

There may or may not be fever at the onset, but it is usually present at some time during the course of the disease. It is usually slight, an elevation of 1 or 2 degrees, lasting from a few days to two to three weeks. In some instances there may be marked pyrexia, up to  $105^{\circ}$ , which may last for several days, or in some instances only for one day. The patients may complain of headache, vertigo, tachycardia, and there may be vomiting.

The focal symptoms are motor rather than sensory; one of the early very suggestive symptoms is diplopia due to paralysis of one or more of the muscles, and ptosis is not at all uncommon. In some instances but one eye muscle, as the external rectus, may be involved. A very striking manifestation is the mask-like expression of the face, due to a loss of power of the facial muscles. This suggests the appearance of a person with paralysis agitans.

There may also be difficulty in swallowing and in articulation. There may be other things noted in the examination of the patient, as sometimes paralysis of the extremities involving an arm or a leg, sometimes a hemiplegia and sometimes a diplegia. There may also be aphasia. In some patients there are choreiform or athetoid movements, sometimes contractures and quite frequently a sort of cataleptic condition in which the patient will remain in the position in which he is placed for some time.

There may be some evidence of involvement of the sensory system as shown by presence of anesthesia, paresthesia, sometimes hyperesthesia; cases in which there is hemianopsia have also been reported. In rare instances the suffering may be acute and severe. Various forms of ataxia may be observed varying with the location of the lesion, the commonest form being the cerebellar type. Meningeal symptoms are relatively rare. There may be rigidity of the neck with pain, and this may extend to the entire spine. Brudzinski's and Kernig's sign may be elicited in some. The lesions in the brain are met with chiefly in the nuclei of the third, fourth and sixth nerves and in the midbrain about the aqueduct of the cerebrum, the pons and the upper medulla and basal ganglia.

Among the larger studies is a piece of work by Tilney and Howe.<sup>71</sup> This is a monograph of some two hundred and fifty pages with some fifty-five illustrations, illustrating for the most part either the pathologic changes or the clinical manifestations of the disease. The study is interesting because it is very largely based on the personal observations of the authors but it should be rewritten and rearranged to suit it to the use of the busy doctor. They suggest dividing the disease for purposes of description into eight clinical types as follows:

1. The lethargic type.
2. The cataleptic type.
3. The paralysis agitans type.
4. The polioencephalitic type.
5. The anterior poliomyelitic type.

<sup>71</sup> Epidemic Encephalitis; Hoeber, New York, 1920.

6. The posterior poliomyelitic type.
7. The epilepto-maniacal type.
8. The acute psychotic type.

They seem to have overlooked the myoclonic type and some other forms as well.

Bramwell<sup>72</sup> has contributed a short but excellent article and suggests that the clinical features of the common type be classed in three groups as follows:

"1. Febrile disturbance which is met with almost invariably in the initial stages. Although, as a rule, slight in degree and consequently liable to escape detection, this symptom is important in relation to diagnosis. Accompanying the fever certain general symptoms, such as headache and, less commonly, giddiness and vomiting, are often met with during the earlier days of the illness.

2. A state of progressive somnolence, apathy, and lethargy, from which the affection derives its appropriate designation. This symptom, which is present in the great majority of cases, is associated with slow mental action, want of initiative, and when pronounced, as a rule, with an occupational delirium.

3. Symptoms referable to focal disturbances in the function of the nervous system, in consequence of the structural changes produced by the morbid process. These vary according to the region of the nervous system in which the lesion is situated or most pronounced. The frequency with which paresis of the ocular muscles, notably of those supplied by the third nerves (ptosis, strabismus, defective movements of the eyes, nystagmus, unequal and sluggish pupils, and defective accommodation), and paresis of the face are met with is explained by the fact that in the majority of cases the mesencephalon and pons are the special regions selected by the process."

A very clear statement of the various forms of the disease has been given by MacNalty<sup>73</sup> which is well worth reprinting:

"1. The common or mesencephalitic type, to which the great majority of cases belong. This type is characterized, as has been mentioned, by febrile disturbance and by a state of apathy, somnolence, general lethargy, or even stupor, associated with paresis of the ocular and facial musculature. The diagnosis here presents little difficulty.

2. A type in which the lethargy, somnolence, and sometimes symptoms of meningeal infection are pronounced, while focal nervous symptoms are either inconspicuous or absent. Cases of this kind are by no means infrequent. They are liable to be mistaken for a variety of other conditions, among which I would especially mention the following, which I have known to give rise to difficulty in diagnosis, *viz.*: Cerebrospinal fever, cerebral arteriosclerosis, and uremia.

3. Cases which present striking focal symptoms, referable to the mesencephalon (ophthalmoplegia, facial paralysis, etc.), though the initial febrile disturbance has been so slight and evanescent that it has escaped notice, and the somnolence and lethargy are inconspicuous and overshadowed by the focal manifestations. In 3 cases of the kind which

<sup>72</sup> Lancet, May 29, 1920, p. 1152.

<sup>73</sup> Reports to the Local Government Board, New Series, No. 121, 1918, p. 12.



I have met with, a diagnosis of intracranial tumor had been previously advanced by a competent observer. It is, indeed, very probable, as Nonne has suggested, that some of the reported instances of supposed intracranial neoplasm, in which the growth of the tumor had apparently become arrested, have been cases of encephalitis.

4. An abortive type, illustrated by one of my cases, in which the symptoms, never pronounced, pass off more or less completely in the course of two or three weeks.

5. A type which closely resembles paralysis agitans. The similarity which some cases of encephalitis lethargica present to paralysis agitans has been emphasized by Farquhar Buzzard. Several such cases have come under my notice. The resemblance was particularly striking in the case of one patient, in whom the expressionless face, the monotonous voice, attitude and gait so closely resembled Parkinson's disease that, had no history of the illness been available, it would have been difficult to differentiate between the two conditions. In another case, a rhythmic tremor confined to one arm presented features indistinguishable from that of paralysis agitans, while the immobility of the face emphasized the similarity. Here, again, a history of a febrile onset with diplopia, together with the subsequent course of the illness, placed the diagnosis beyond question. No doubt the phenomena met with in this type of the disease are to be explained by implication of the red nucleus or rubro-spinal tract.

6. Cerebellar ataxia was a striking feature in one case in which the symptoms suggested the possibility of disseminated sclerosis, an alternative diagnosis which in two other instances was only dismissed after full consideration of all the facts. In a second case in which recovery was eventually complete, the association of cerebellar symptoms, with somewhat severe headache and vomiting, raised the question of a tumor in this region of the brain.

7. Progressive focal symptoms referable to the motor nuclei of the lower cranial nerves in the medulla, and unaccompanied by any general manifestations, were observed in one case in which the diagnosis between tumor and encephalitis remained doubtful until eventually determined by postmortem examination. In distinguishing between tumor and encephalitis I would, in passing, remind you that the difficulty is accentuated by the fact that neoplasms situated in the brain-stem are often unaccompanied by indications of increased intracranial pressure (headache, vomiting, and optic neuritis), while, further, the focal nervous symptoms in encephalitis lethargica may be progressive.

8. A cerebral localization was observed in 3 cases; in 2 of these hemiplegic symptoms, in the third a monoplegia, were, in my opinion, dependent upon an encephalitis. The diagnosis in 2 of these cases was based on the fact that there was a history of a definite febrile onset with ocular palsies, while in none of the three were there indications pointing to any other factor which might account for the paralysis. Recovery was complete in all, a fact which afforded corroborative evidence as to their nature."

THE SYMPTOMS FROM AN ANATOMIC BASIS. Studying the cases on an anatomic basis will be found of considerable value, just as it has

been in poliomyelitis. Tilney and Howe believe that most of the cases may be placed in one of eleven groups and state that abortive cases may be noted in many of these, that is, the disease will start, probably have its chief localization in some one of the regions mentioned below and there produce more or less distinct localizing symptoms, but recover promptly before any serious damage has been done. These cases are analogous to abortive cases of poliomyelitis.

The eleven groups of Tilney and Howe are as follows:

1. Cases with general symptoms. In the early stages show evidence of cerebral irritation as manifested in restlessness, delirium, and sometimes hallucinations and delusions. Later there is lethargy, stupor, and general muscular rigidity. The onset is usually attended with fever and in the fatal cases it is usually present before death. The lethargy or coma is the most striking feature, although there may be slight evidence of involvement of the cranial nerves, as ptosis, double vision and the like.

2. The meningitic type, which shows the characteristic manifestations; fever, headache, stiffness of the neck, slight Kernig sign, and so on.

3. The cortical type Tilney and Howe have not seen or been able to find records of cases where cortical lesions predominated, but in the course of the lethargic cases there may be isolated monoplegias and aphasias pointing to localization in the cortex.

4. The pyramidal system type. These are characteristic and the onset may be a sudden hemiplegia. The cranial nerve nuclei may be involved later, or there may be other lesions and characteristic manifestations.

5. The thalamic type. These show ataxia and choreo-athetoid movements, although Tilney and Howe state that there are no cases reported which show the typical thalamic syndrome.

6. The corpus striatum type. These suggest more or less typically the syndrome of Parkinson's disease with paralysis agitans, that is, general muscular rigidity, mask-like expression, the characteristic tremor with the pill-rolling motion of the thumb and forefinger and a lessening of the tremor on voluntary motion. The attitudes are bowed and rigid and the gait typical with rapid, short steps.

7. The brain-stem type. These are characterized by cranial nerve palsies, but, of course, more or less involvement of the cranial nerves is seen in most of the cases.

8. The cerebellar type. These show a typical ataxia as the chief manifestations.

9. The spinal type. These may show signs of involvement of the cells of the anterior horn and resemble the same type of poliomyelitis. In other instances the posterior horn may be affected and produce a posterior poliomyelitic type.

10. The peripheral nerve type. These occur infrequently, and Tilney and Howe have reported a case in which there was muscular spiral palsy.

11. The multiple diffuse lesion type. These suggest multiple sclerosis frequently, the lesions being scattered throughout the brain and spinal cord, but not in such a way as to permit them to be classified in any of the foregoing.

Dunn and Heagey give the following arrangement of the symptoms classified anatomically with the frequency, as shown in their own cases and in 100 collected from the literature:

Type.	Symptoms.	100 cases.	15 cases.	Part.
Polio-encephalitic Ophthalmoparetic	Cranial nerve palsies	..	..	Midbrain, pons and medulla.
	III	60	6	
	IV	2(?)	0	
	V	7	3	
	VI	34	6	
	VII	12	5	
	VIII	4	2	
	IX	2	0	
	X	1	0	
	XI	0	0	
	XII	11	2	
	Eyes			
	Diplopia	50	8	
	Anisocoria	25	4	
	Ptosis	20	6	
	Lack of light and accommodation reflex	12	4	
	Sluggish pupils	20	4	
	Retinal changes	10	2	
	Swallowing	13	0	
	Vomiting	8	1	
	Polypnea	1	2	
Lethargy	Lethargy	69	10	Pituitary, thalamus, hypothalamus and cerebrum.
	Insomnia	16	4	
Cataleptic	Catalepsy	20	6	
	Vertigo	19	5	
Meningeal	Nystagmus	17	1	Meninges.
	Ataxia	4	2	
	Headache	47	10	
	Rigidity neck	12	1	
Paralysis agitans	Delirium	24	6	Lenticular nucleus.
	Kernig	3	3	
	Tache	1	0	
	Parkinsonian mask	9	3	
	Spasticity	..	4	
Myelitic	Festination	3	0	Cord.
	Tremor	30	5	
	Bladder	15	4	
	Reflexes disturbed	25	7	
	Babinski	14	7	
Epileptomaniacal	Reflexes absent	2	2	Cerebrum.
	Clonus	5	4	
	Convulsions	0	2	
	Paralyses	0	1	
	Asynergies	20	0	
Psychotic	Epileptiform attacks	..	3	Cerebrum.
	Hallucinations	..	3	
	Illusions	..	3	
	Depression	9	..	
	Delirium	24	7	
Polyneuritic	Pain in extremities	23	3	
	Sensation disturbed	..	1	
	Paresthesias	6	3	
	General symptoms:			
	Epistaxis	1	1	
	Cervical adenitis	..	2	
	Tachycardia	..	1	
	Weight loss	..	5	
	Appetite increased	..	6	
	Fever	43	13	
	Perspiration	6	15	
	Hiccough	5	0	
	Tears	4	0	



**THE SALIVARY GLANDS.** Netter,<sup>74</sup> and others, have called attention to the fact that in some cases of encephalitis there is swelling of the parotid glands, with an increase in salivation, and Netter, in collaboration with Durand, has studied the parotids of a boy two and a half years of age who died two days after the onset of the disease. Macroscopically, the glands did not seem to be changed, but microscopically there were found to be large numbers of mononuclear cells in the interlobular spaces about the vessels, and the ducts of the acini. The lesions resemble very closely those noted by Manouëlian in his study of the salivary glands in rabies.

**THE EYE SYMPTOMS.** Among the cardinal signs of encephalitis are the ocular paralyses. These have been studied by a number of different observers and articles dealing with this subject have been contributed by Ferrari,<sup>75</sup> Lapersonne<sup>76</sup> and by Achard.<sup>77</sup> The study of Ferrari is a personal one and is based on a complete systematic study of 40 patients. He found that there were lesions in the motor apparatus of the eye in 80 per cent. of the cases taken all in all, and practically always in the more severe forms. The ocular paralyses of epidemic encephalitis are characterized by their incompleteness and frequency with which only partial paralysis is met with and the great variability of the findings.

Paralysis of the extrinsic muscles with a consequent diplopia, has been most frequently noted. Some idea of the numerous different kinds of ocular involvement may be had by referring to the section dealing with this subject in Potet's review. All observers are agreed as to the frequency of eye involvement. Sicard and Kudelski have noted an ocular myoclonus without any changes in the pupillary reactions, and both horizontal and vertical changes have been noted by Netter, Lesné, Sainton and Lhermitte. Widal reports an instance in which contraction of the eyebrow was the only ocular manifestation. Widal believes that many times the ocular paralyses are present, but require a trained ophthalmologist to determine this fact, a belief shared by many others.

The diplopia and strabismus is most frequently due to lesions in the third pair of nerves, sometimes to the sixth and, less frequently, to the fourth. In some instances there has been complete paralysis of all the muscles enervated by these three nerves and this may be present on both sides or limited to one side. At other times there is simple weakness of the muscle. Sometimes the eyes move normally and at other times the movements are interfered with. Numerous authors have commented upon the fact that the ocular paralyses may be transient and so easily escape notice unless the patient is very carefully watched all the time.

The internal muscles of the eye may also suffer, causing disturbances of accommodation and sight in consequence, and there may be disturbances in the pupil, with myosis and inequality in the size of the pupils (anisocoria). Courmant has called attention to the slowness

<sup>74</sup> Bulletin de l'Académie de Médecine, April 27, 1920, p. 383.

<sup>75</sup> Il Policlinico, Sezione Medica, August, 1920, p. 301.

<sup>76</sup> Bull. de l'Académie de Médecine, Paris, April 27, 1920, p. 384.

<sup>77</sup> Ibid., p. 387.

of the pupil reactions in some instances. Ely has referred to the irregularity of the pupil, and the Argyll Robertson pupil has been noted by a number of different observers.

As to the changes in the eye grounds, these are exceedingly variable. In the mildest form observed there is a very small amount of optic neuritis and this may be present in one or both eyes and sometimes accompanied with small hemorrhages. Cases have been reported in which there was amaurosis to the extent that the patients could not distinguish between light and darkness; while in others there has been a loss of color vision; and in still others the amaurosis amounts to a simple diminution in the power of sight, without anything approaching actual blindness.

**THE LETHARGIC TYPE.** One of the best articles from every standpoint is by Economo.<sup>78</sup> His description of the lethargic type is short and may be quoted:

"The patient sleeps standing, sitting and in any position, no matter how uncomfortable. In the first stage of the disease he may be awakened easily and presents a consciousness, somewhat hazy, but well oriented. The patient understands everything, gives satisfactory and logical answers, even on subjects which are not elementary, but left to himself he soon falls asleep again.

"On examination one notes rather regularly disturbances in the muscles. Most frequently there is ocular motor paralysis and of the levator palpebræ. The abducens is the most frequently affected, but there may be conjugate paralysis and nystagmus. Less frequently there are changes in the other cranial nerves, disturbances of speech and difficult deglutition. There may also be disturbance of coördination and of the sense of equilibrium. This may be noted even at the beginning of the disease, and there may also be peripheral paralyses and changes in the reflexes.

"The temperature is atypical. The disease may begin with an attack of fever or the onset may be afebrile. When it begins with fever, this may disappear; and when there is none at the beginning, it may come on during the course of the disease. The somnolence, excluding certain small fluctuations, increases progressively and is associated with a delirium which has a certain resemblance to that noted in alcoholics, but if there is a difference it is that the sleep is more calm and the patient almost always has the eyes closed. Even in this stage the patient can still be awakened, but in case the disease progresses further the somnolence is transformed into a deep coma which renders forced feeding necessary. Sometimes one observes variations in the depth of the slumber, as the patient may become conscious for one or two days and then again fall into a state of coma. In this stage of coma the patient may die or it may last for several weeks or months and finally end in complete cure, or there may be some slight residuary paralysis. In any event, the disease is to be regarded as one of gravity and of doubtful prognosis."

<sup>78</sup> Il Policlinico, Sezione Pratica, March-April, 1920, p. 1.

*The Cause of Somnolence.* In a study based on 17 cases with 2 necropsies, Russel<sup>79</sup> comes to the conclusion that the somnolence, which is one of the characteristic features of so many cases of the disease, depends on the site of the lesion; that when it is in the posterior part of the pons near the aqueduct of Sylvius, a small area of swelling will close off the canal, so blocking the foramen of Magendie with a relative damming back of the fluid and, in consequence of this, an acute hydrocephalus.

**THE CATALEPTIC TYPE.** The cataleptic type may begin almost any way, usually with acute symptoms and there may or may not be the involvement of the ocular muscles. Sooner or later the patient passes into a deep sleep; sometimes it is impossible to arouse them; at other times they may be aroused by direct questioning and more or less satisfactory answers may be given, but as soon as the questioning stops the patient relapses into the sleep. These patients usually lie on their back, the eyes and mouth are closed, the forearm slightly flexed on the arms, the expression is mask-like and has very aptly been described by Hall as presenting the appearance of an effigy on a tomb. Into whatever position the patient may be placed, he will remain without making any effort to change it. When the arms or legs are raised, they usually show a coarse tremor, and the extremity remains in the position in which it is placed for a certain length of time before falling to rest, suggesting the cataleptic state of a person who has been hypnotized. I have seen one patient of this type who remained for six weeks in a perfectly quiescent state, then gradually waked up and made an uneventful, complete recovery. In this particular instance, the disease started with a slight ocular palsy. There was the characteristic double vision so often seen at the onset of the disease.

**THE MYOCLONIC TYPE.** There have been several contributions on this form of the disease, among others by Boveri<sup>80</sup> and by Phillips.<sup>81</sup> The reporting of these cases and others reopens the whole subject of myoclonus which has naturally always attracted a considerable amount of attention owing to the very obviousness of the symptoms. Dubini, in 1846, described a condition which certainly was very similar to the myoclonic form of epidemic encephalitis. He called it electric chorea, but he probably included cases that were due to other causes. Other descriptions were given, chiefly in Italy by Frua, Morganti, and others. Boveri reports two cases and Phillips one.

One of Boveri's cases was a girl of nineteen, who previously had influenza. She had slight cyanosis of the face, injection of the ocular conjunctivæ, irregular contractions of the hands, delirium and slight fever. There was no paralysis of the eyes or cranial nerves. This condition lasted about ten days, when there appeared short rhythmic contractions of the arms, hands and fingers, but mostly on the right side. The contractions were at the rate of sixty-five to sixty-eight per minute. There was also a contraction of the quadriceps of the right thigh.

There was no lethargy in the other case, a woman of forty. The

<sup>79</sup> Canadian Medical Association Journal, August, 1920; No. 8, p. 696.

<sup>80</sup> British Medical Journal, April 24, 1920, p. 570.

<sup>81</sup> Ibid., May 8, 1920, p. 634.



contractions were first in the right sternomastoid and trapezius muscles and diaphragm at the rate of about forty a minute. Later, the neck contractions decreased and there were strong, rhythmic contractions in the abdominal wall and also in the muscles of the right thigh.

Both of these patients were in the same condition at the time of the report, the striking symptom being the presence of myoclonic movements, both rhythmic and partial, like that produced by an electric current.

Ellis<sup>82</sup> has described 3 cases, all of which had forceful, shock-like contractions of the abdominal muscles which occurred at the rate of thirty to forty to the minute. The pupils were widely dilated and there was profuse sweating and tachycardia. After the onset the dilatation of the pupils disappeared. All of these patients showed a well-marked leukocytosis, with a slight relative increase of the polymorphonuclears. Other observations on this subject have been made by Sicard and Kudelski;<sup>83</sup> Carnot and Gardin;<sup>84</sup> Oettinger;<sup>85</sup> Netter;<sup>86</sup> Briand and Rouquier;<sup>87</sup> Benard and Boissart;<sup>88</sup> Roger and Aymes;<sup>89</sup> Claud;<sup>90</sup> and Remond and Minvielle.<sup>91</sup>

Another article on the same subject has been contributed by Hunt<sup>92</sup> and the results of one by Pardee.<sup>93</sup> The latter is noted elsewhere in this review. Hunt reports 2 cases of the sporadic type; one occurred in 1904 and one in 1914; and 6 cases of the epidemic variety. He states that the disease begins rapidly, with shooting pains which increase in intensity, and rapidly become generalized. They may begin either in the arms or the legs and either immediately or, more commonly, after an interval of several days the muscle twitching begins and continues long after the pain has disappeared. Various forms of muscle contraction have been noted; fibrillation, the so-called myokymia or muscle wave and the contractions of the whole body and the muscles (myoclonus). In the sporadic cases the muscle waves and twitchings were generalized, and this was also true of the earlier cases of the epidemic type, and later, when the epidemic was on the wane, a milder type was encountered without active delirium, and the muscle twitching was limited to the lower half of the trunk muscles. The delirium that is generally present is like that of a toxic delirium. There are hallucinations, illusions and transitory delusions. There are restlessness, insomnia, apprehension, disconnected thought and mental confusion, and this may later change to apathy and a tendency to stupor.

The pathology of the disease is still practically unknown. This type of myoclonus is not to be confused with that due to disturbances in the cortex, and Hunt believes that at the present time to state more than that there are irritative manifestations referable to the spinal level of motility, would be hazardous.

<sup>82</sup> Lancet, July 17, 1920, p. 114.

<sup>83</sup> Bull. et Mém. de la Soc. Méd. des Hôp. de Paris, 1920, xxxvi, 94.

<sup>84</sup> Ibid., p. 125.

<sup>85</sup> Ibid., p. 132.

<sup>86</sup> Ibid., p. 237.

<sup>87</sup> Ibid., p. 267.

<sup>88</sup> Journal of the American Medical Association, September 11, 1920, p. 713.

<sup>89</sup> Archives of Neurology and Psychiatry, July 24, 1920.

<sup>85</sup> Ibid., p. 129.

<sup>87</sup> Ibid., p. 193.

<sup>89</sup> Ibid., p. 244.

<sup>91</sup> Ibid., p. 279.

The differential diagnosis ought not to be difficult after the characteristic manifestations come on. Multiple neuritis can be eliminated by the absence of motor and sensory paralysis and of tenderness. The electric chorea, Dubini's disease, has never been reported in America. In the acute stage there is headache and backache which are followed by myoclonic contractions of cerebral origin and convulsive attacks suggesting Jacksonian apoplexy, and, later on, muscle groups that had the myoclonus waste and show changes in the electrical reaction. The myoclonic form is, perhaps, more liable to be confused with chorea, especially when the latter shows the mental disturbance that it so often does in the severer cases. I had one instance in which this mistake was made, but, if the movements are carefully studied, one is not likely to fall into this error. In myoclonia there are the various forms of muscle jerks and twitchings, whereas in chorea the movements are purposeless, not coördinated.

Hamill<sup>94</sup> has reported 4 cases in which there were involuntary movements which were much more active during sleep. In 3 of these cases there was some disturbance of the bladder requiring catheterization. In 3, the patients were quite unconscious of their movements, and in 2 they were strongly suggestive of the movements of a fairly strong galvanic current. They were increased by excitement, but voluntary movements had no effect on them. The rhythmic contractions of the sternocleidomastoids could be seen going on with their ordinary rhythm during voluntary inspiration. Hamill believes that these movements are due to the involvement of some mechanism or center in the midbrain or hind-brain that is in direct connection with the respiratory center.

Sicard and Kudelski,<sup>95</sup> in their study of acute myoclonic encephalitis, do not mention the effect of sleep on the movements and whether they are bilateral or not, while in the cases reported by Buzzard,<sup>96</sup> all the movements ceased during sleep.

**THE PARKINSONIAN SYNDROME.** This type of epidemic encephalitis has been recognized by practically all those who have made extensive reports on the subject. One of the best communications is that of Marie and Levy.<sup>97</sup> In the first observations published, it was remarked that some of the patients suggested paralysis agitans (Parkinson's Disease). They had the stiffness of attitude and the typical expression on the face. Since then the Parkinson syndrome has had a prominent part in the clinical history of encephalitis. In a word, certain numbers of individuals affected with encephalitis sooner or later show the mask-like facial expression, the stiffness of the back, the festinating gait, the slow movements, the slow, monotonous, feeble voice, and even the writing shows a change, in that the letters are smaller than before the disease and are liable to indicate a certain amount of tremor. The lesions causing this syndrome in the aged is located in the cerebral peduncle, particularly in

<sup>94</sup> Archives of Neurology and Psychiatry, July, 1920, p. 44.

<sup>95</sup> Bull. et mém. Soc. méd. d. hôp. de Paris, January 29, 1920, p. 95.

<sup>96</sup> Proceedings of the Royal Society of Medicine, Neurological Section, August, 1919, p. 56.

<sup>97</sup> Bulletin de l'Académie de Médecine, June 15, 1920, p. 539.

the region of the *locos niger*. In spite of their similar outward appearance, Netter and Levy point out what is apparent that the Parkinsonian syndrome of encephalitis and the typical paralysis agitans are two very distinct conditions.

The age of onset is very different; in paralysis agitans symptoms rarely appear before forty-five years of age, and it is generally in the fifties or after sixty is passed before the disease manifests itself, while in encephalitis the symptoms of this type are most often between twenty and forty years, which is the period of life in which epidemic encephalitis is most frequent. These ages do not represent the limits, as the same syndrome may present itself even in children, Marie having a case in a child of twelve years of age.

The onset of the symptoms in the encephalitic types are preceded by fever, vertigo, ocular palsies and other signs and symptoms characteristic of the disease, while in paralysis agitans there is often nothing in the previous history, the disease coming on slowly without apparent cause. In paralysis agitans the progress of the disease is very slow and there may be months intervening between the extension of the disease from one member to the other, even on the same side of the body, while in encephalitis the disease comes on quickly and, in place of the hemiplegic progression of paralysis agitans, the trunk and extremities are often affected at the same time. Marie states that in encephalitis there is an absence of the typical tremor, the pill-rolling motion, but this does not extend to all cases. Marie makes the observation that in the cases of encephalitis in which there is a tremor it is more often augmented on voluntary movement than otherwise, whereas in paralysis agitans voluntary motion causes either a cessation or diminution of the tremor. He also calls attention to the fact that in encephalitis there is frequently spasmodic, shock-like motions on one side of the face, which are not noted in paralysis agitans, the only thing present there being the trembling of the lips and chin. In typical paralysis agitans the abnormal movements of the tongue are rare, while in encephalitis it may be difficult or impossible for the patient to protrude the tongue, or if it is done there is a tremor or fibrillation. In the encephalitis syndrome, too, there may be difficulty in opening the mouth and in chewing, the latter being almost entirely carried on by the front teeth, and some are not able to take anything except liquid food. Trismus is also not infrequent, and none of these difficulties are met with in typical paralysis agitans. The evolution of the two conditions are entirely different. Paralysis agitans is a steadily progressing disease, while in the encephalitis cases the patient may die or may get entirely well, although some cases have been observed in which, up to the time of the reports, the patients were still suffering from the effects of the disease.

Destafano<sup>98</sup> gives in detail an instance in a man thirty-three years of age in which the general picture of the disease resembled very closely that of paralysis agitans. There was rigidity of the neck and also of the rest of the spine, and when the patient walked it was with one foot with

<sup>98</sup> La Semana Medica, July 8, 1920, p. 33.



very small steps and without flexing the knees and with a tendency to fall forward. Similar cases have been recorded in great number.

**ACUTE DESCENDING RADICULAR TYPE.** This disease may occur also as a distinct form corresponding to the *syndrome radiculaire* of Dejerine. He noted the frequency of localized radiculitis in the lumbosacral and brachial segments and its rarity in other sections of the cord, and he states that the rarest of all is in a more or less generalized form.

Pardee<sup>99</sup> has reported 5 cases. The movements began with the higher cervical region and terminated in the sacral. The chief symptoms are the sharp lancinating root pains, paresthesia, muscular spasms, hyperesthesia, delirium and fever. The disease begins by the patient complaining of slight paresthesia in the back of the neck or shoulders. Within twenty-four hours sharp shooting pains develop in the back of the neck or shoulders, and then progress downward to one or both arms. The pains are severe, sudden or knife-like in quality, and intermittent, suggestive of the lightning root pains of tabes, although of greater intensity. They prevent sleep and are only relieved by morphin. All sorts of paresthesia accompany the pain, including numbness, tingling, burning, formication and "pins and needles" sensation. After several days, involuntary muscular spasms appear, causing forced movements of the shoulders and head and neck, being reminiscent of the spasmodic contractions occurring in spinal-cord tumors. These spasms are present during sleep. If the arms are affected, it may be almost impossible for the patient to feed himself. After a week or so the symptoms become less severe in the arms, and delirium occurs. There is hallucination and delusion, and the patient shows considerable mental confusion. This lasts from three to four days and is followed in two weeks by dulness and lack of interest almost to the point of apathy, but no real drowsiness or lethargy was noted at any time in any of the cases. Sometimes at the onset there is a chill and slight fever. The disease then progresses downward for two or three days, involving the intercostal and abdominal regions, the pain being less severe, but increasing tremendously when the disease reaches the lower part of the cord and affects the legs. With the invasion of the lumbosacral region, there is a slight increase of the fever, and after four or five days a return to 99° or 100°, and the patient gradually convalesces after several weeks.

There are no vasomotor, trophic or sensory changes other than those mentioned, and there is no anesthesia to touch, pain or temperature, no disturbance of deep sensibility, no herpes, no marked changes in the reflexes except a slight exaggeration of the deep reflexes at the onset and diminution several days after invasion of each region. Toward the end of the convalescence there is some weakness of the hands, and a beginning atrophy in the muscles of the hands and arms. In addition to the symptoms noted above, there was an involuntary flexion of the head which was not done for the relief of pain and suggested the attitude seen in cerebrospinal tumor, syringomyelia, and sometimes in amyotrophic lateral sclerosis.

<sup>99</sup> Archives of Neurology and Psychiatry, July, 1920, p. 24.

Pardee also reports a case of radiculitis with delirium, but on the ninth day the patient complained of diplopia, weakness of the left sixth nerve, somnolence, presenting all the clinical features of an epidemic encephalitis, with death four days after the beginning of these symptoms. In another case of typical radicular syndrome with delirium during the first weeks, there was some tendency to lethargy, the typical lack of facial expression, diplopia and other evidences of encephalitis. In another case after a typical descending radiculitis as far as the last thoracic segment, but here the process reversed, a diplopia developed and the symptoms ascended to the occiput, with hyperesthesia as the most prominent symptom.

EPIDEMIC ENCEPHALITIS IN CHILDREN. Neal<sup>100</sup> has an interesting article on this subject under the heading of Epidemic or Lethargic Encephalitis in Children. She made a study of 58 cases in which 44 were boys and 14 were girls. She found that the average duration in children is under six weeks, and in only one instance did she observe a prolonged case.

The special differences from the disease as it occurs in adults is that the onset is more frequently sudden, that there are fewer paralyses and fewer disturbances of vision. The differential diagnosis in children, Neal states, must be made from tuberculous meningitis, brain tumor, meningism from some unknown underlying cause, syphilis, involvement of the nervous system and poliomyelitis or polioencephalitis and meningitis. This is the same list that would be made for grown people, except that the latter would also include cerebral hemorrhage or thrombosis and uremia.

The diagnosis from tuberculous meningitis is by no means easy and I know of instances in which neurologic experts of no mean ability have erred in this direction. Neal states that the clinical picture of a well-developed case does not present quite the serious aspect that a tuberculous meningitis would after the same time, say two or three weeks. Vomiting is a less constant feature, and the pulse is more likely to be regular in encephalitis than in tuberculous meningitis. The final diagnosis must be made by examination of the spinal fluid, and even here the first examination may cause doubt. While the number of cells, albumin and globulin is greater in tuberculous meningitis, it is not necessarily so, and the reduction with Fehling's solution may be normal at times. It is also difficult to find a tubercle bacilli in tuberculous meningitis so that in doubtful cases a number of cultures should be made, using fluid from different punctures. In case of doubt, the diagnosis should be withheld until the case has been studied sufficiently to permit one to express a definite opinion.

As regards brain tumor, the condition is uncommon in children and, as a rule, runs a much slower course. Eventually there will be choked disk, which does not occur in encephalitis, although in some instances slight edema has been noted. The change in the spinal fluid in brain tumor is not constant. There is sometimes an increase in cells, but rarely an increase in albumin or globulin.

<sup>100</sup> Archives of Pediatrics, June, 1920, p. 321.

In the mild cases in meningism a normal spinal fluid will suffice to make the diagnosis clear. There are, however, cases of meningism in which the cerebrospinal fluid is not normal, but shows an increase in the proteid content or cells, or both. Neal divides these cases into four well-defined groups: (1) With severe and prolonged convulsions as the convulsive type of whooping-cough. (2) Cases in which the meningism has persisted for a long time without relief of pressure, especially in cases that are moribund when seen. (3) Cases with an inflammation near the meninges as otitis media, mastoid or sinus involvement, called by Strauss *meningitis sympathetica*. (4) A miscellaneous group of conditions, such as mumps, typhus fever, etc.

Syphilis of the central nervous system is uncommon in children and Neal assumes that a negative Wassermann of the spinal fluid rules out a syphilitic condition of the nervous system.

The differential diagnosis from the encephalitic form of poliomyelitis in mild cases Neal believes is impossible and she states that if some of the cases in which the diagnosis of epidemic encephalitis was made had occurred during the epidemic of poliomyelitis in 1916, they would have been called the encephalitic form of poliomyelitis.

Acute purulent meningitis, as a rule, presents no difficulty, although atypical cases may be confused clinically, but scarcely after the examination of the spinal fluid. The excess of polymorphonuclear cells, the diminished or failing Fehling's reaction and the presence of the positive organisms should make the differential diagnosis easy.

A question of cerebral thrombosis or embolism may present unusual difficulties, as there may be at times a monoplegia or hemiplegia in encephalitis and in cases with cerebral hemorrhage or embolism there is usually drowsiness and a slowness of response.

Neal believes that lumbar puncture offers relief in most cases and that it should generally be repeated, but she suggests not oftener than every week or ten days in most cases, and in many only a single puncture may be indicated.

Reilly<sup>101</sup> has briefly described a sign which he believes to be strongly suggestive, if not diagnostic, and of particular value in the cases in children in which the picture is almost identical with tuberculous meningitis. The sign consists of a rhythmic convulsive twitching of the muscles of the abdomen in the neighborhood of the eighth or ninth ribs. It often simulates the muscular movement of hiccough, except that it is one-sided. In two cases it involved the trapezius. Reilly has observed this sign in all cases that he has seen except two. When the patient is conscious the twitching is beyond the voluntary control.

SECONDARY SIGNS OF THE DISEASE. These are interesting, but are valueless and doubtful on account of the difficulty of ascertaining what is actually due to the encephalitis infection and what to coincident pathologic changes. The changes in the respiration are often very marked, there being acceleration or differences in the movements of the two sides. As regards the digestive tract, indigestion and vomiting are

<sup>101</sup> Journal of the American Medical Association, March 13, 1920, p. 735.



the most frequent, but diarrhea or constipation have been included in the reports of some authors. The spleen has been reported as enlarged in some cases, purpuric rashes have been noted, and swellings of the joints or of the tendon sheaths have been included by Claud and others.

**EPIDEMIC HICCUGH.** There have been epidemics of hiccough reported from Paris, Berlin and Geneva. Gautier<sup>102</sup> reports 5 cases from the last named city, all of which were characterized by intense spasmodic hiccough coming on suddenly, persisting from two to four days and then disappearing with equal suddenness. Treatment seemed to have but little or no effect. In one instance in which the spinal fluid was examined it was found to be practically normal. It has been suggested that this is a mild form of epidemic encephalitis.

**ENCEPHALITIS IN PREGNANCY.** This subject has attracted a certain amount of attention, and Schulze<sup>103</sup> has collected 7 cases in the literature and quoted one which she observed. She states that in the epidemic of 1890 no cases complicating pregnancy are mentioned. One, of course, does not know how thorough her search of the literature of that epidemic was.

Encephalitis is said to be more common in the male than in the female, a point recently emphasized by Neale.<sup>104</sup> Of 199 cases there were only 67 occurring in women and girls, and of these only 33 were in women of child-bearing age. While the mortality rate is said to be higher in women than in men, it seems to be particularly high in pregnant women. In the 8 cases collected by Schulze, 1 recovered, 5 died and in 2 the outcome was not stated. The only case of recovery was that reported by Neale, which occurred in a woman of twenty-five, who was five months pregnant. She had had an attack of influenza two weeks before the onset of the encephalitis. The onset was gradual, with headache, chills, vomiting, fever, sweating and delirium and the condition remained the same for two weeks or more, when it gradually cleared up and she had a normal delivery at term.

**ENCEPHALITIS AND SYPHILIS.** The combination of encephalitis and syphilis may lead to clinical pictures which, in the present state of our knowledge, may be practically impossible to explain, as the two diseases may produce very similar symptoms, and if an attack of encephalitis supervenes in a syphilitic involvement of the nervous system, it would be impossible to say what is due to syphilis and what is due to encephalitis. Jeanselme<sup>105</sup> has made some observations on this subject and calls attention to the fact that the ordinary symptoms of involvement of the nervous system by syphilis are headache, delirium, or marked changes in the intelligence, which are permanent, the Argyll-Robertson pupil and paralysis of the cranial nerves or extremities.

**ENCEPHALITIS AND TUBERCULOSIS.** Page<sup>106</sup> has reported 2 instances of lethargy coming on in the course of individuals affected with tuberculosis and from a study of these 2 isolated instances he is of the opinion

<sup>102</sup> *Revue Médicale de la Suisse Romande*, May, 1920, p. 290.

<sup>103</sup> *Journal of the American Medical Association*, March 13, 1920, p. 732.

<sup>104</sup> *Archives of Neurology and Psychiatry*, September 1, 1919, p. 271.

<sup>105</sup> *Bulletin de l'Académie de Médecine*, March 2, 1920, p. 210.

<sup>106</sup> *Gazette des Hôpitaux*, January 31, 1920, p. 171.

that encephalitis is not a specific disease, but a syndrome produced by toxins from numerous infections. There is no question that the cortex and other parts of the brain may be affected by various toxins with production of a clinical picture either like or not unlike the disease known as encephalitis. A study, however, of this last-named will convince anyone that we are dealing with a very definite infection.

ENCEPHALITIS AND INFLUENZA. The relation of encephalitis to influenza is interesting, both from a historical standpoint, as noted at the beginning of this article, and also because many observers believe they have noted some relation between the two diseases, many of the patients suffering with encephalitis having previously had influenza or, at any rate, had been closely associated with it. When one bears in mind the large number of individuals who had influenza it is not strange that there should be a considerable amount of coincidence in the two diseases.

In the series of cases described by Tilney and Howe, 50 per cent. gave no history suggesting influenza unless one includes the abrupt onset and cerebral symptoms as evidence. These authors suggest, as have others, that there may be some relation between the two diseases, one preparing the soil for the other. To quote Tilney and Howe, "it is not unlikely that the relation between these two diseases may be a mutualistic symbiosis, or that one may be metabiotic to the other;" which reminds one of the advice given by Erasmus in his justly celebrated essay "In Praise of Folly," where he advises one about to take up authorship to use Latin and Greek words, because they will then be popular, pleasing those persons who are able to understand them and exciting the reverence and awe of those who cannot.

Litvak,<sup>107</sup> as well as others, has called attention to the fact that both in influenza and in epidemic encephalitis the asthenia is out of all proportion to the length of the disease and its severity, and he goes on to consider the clinical and written evidence as to the two diseases having a common origin.

ENCEPHALITIS AND POLIOMYELITIS. The relation of epidemic encephalitis to poliomyelitis is probably close. They may be first cousins, as it were. But the Heine-Medin disease, which even so careful an author as Barker refers to in parenthesis as *poliomyelitis anterior acuta*, is certainly an entirely distinct disease, as anyone who has had much experience with the two diseases clinically can bear witness. It is true that the various forms of poliomyelitis are clinically not unlike some of the manifestations of epidemic encephalitis and it is also true that the lesions in the nervous system and the changes in the cerebrospinal fluid are very much the same, but clinically the difference is marked. In epidemic encephalitis the onset is very gradual, the paralysis limited in extent and with a tendency to be bilateral, and there is little or no fever, while in the Heine-Medin disease the loss of power comes on early, reaches its height and stops. The fever is, as a rule, highest at the onset of the disease or at least early in the disease, and there is a more

<sup>107</sup> Gazette des Hôpitaux, June 8, 1920, p. 821.

marked leukocytosis in the blood and also in the cerebrospinal fluid. Poliomyelitis is a disease of childhood and adolescence, whereas encephalitis attacks all ages. Where the two diseases have occurred at the same time and in the same country, as in England, a careful study shows that the distribution of the two are independent.

It is also highly probable that the disease bears a close relation, but is not identical, with the acute infectious polyneuritis of Bradford, Bashford and Wilson, a disease which was fully gone into in my review last year. Cleland and Campbell studied a form of acute encephalomyelitis that occurred in Australia in 1917 and 1918, and which resembled in many ways epidemic encephalitis and in some ways a meningitic form of acute poliomyelitis, but which they believe to be a different disease. One of the differences was that they were able to transmit the disease to sheep, cats and the horse, as well as monkeys.

We have, then, a group of diseases all of which are probably due to organisms belonging to the same genus, and Barker and his associates refer to the genus as *Flexneria*, and to the virus of poliomyelitis as *Flexneria noguchii*.

**THE DIFFERENTIAL DIAGNOSIS.** This presents very often considerable difficulties. In the first place it must be borne in mind that encephalitis may simulate practically any acute inflammatory disease of the nervous system and that it may produce clinical pictures that cannot be differentiated without recourse to other means of diagnosis.

Cerebrospinal fever may be eliminated by demonstrating the meningococcus in the cerebrospinal fluid; by the fact that the fluid shows a tremendous increase in the number of polymorphonuclear leukocytes and the blood a similar leukocytosis.

Cerebrospinal syphilis shows also a marked increase in the cells, a positive Wassermann of the spinal fluid, increased globulin, and a paretic or luetic colloidal gold curve.

Tuberculous meningitis, perhaps, presents the greatest difficulty. Practically all the observers report instances in which the clinical history might be taken for either disease. Finding the tubercle bacillus, of course, would settle the question, but it is not always possible to demonstrate this. The character of the cerebrospinal fluid may be more or less alike, but perhaps under more or less greater pressure in tuberculous meningitis than in encephalitis.

Typhoid fever, of course, would many times be suspected, particularly if the disease is seen after it is fairly well developed and there may be little or no history of the onset. The enlarged spleen and rose spots and the character of the temperature curve, together with a positive Widal, should serve to make the diagnosis certain.

Diphtheritic paralysis, and perhaps in most instances, can only be differentiated by demonstrating the organism in the mouth or nasopharynx or by a specially clear history before the onset of the loss of power.

Uremia can be eliminated by the examination of the urine, checked by an estimation of the blood-urea or a phenolsulphonephthalein test for renal function.



Botulism may present peculiar difficulties, and, at the beginning of the epidemic that occurred in England, a large number of the cases of the disease were reported under this heading. The character of the food that the patient had eaten, the acute vomiting, diarrhea and faintness coming on generally in a group of individuals who have partaken of the same food, and the demonstration of the organism causing it, are the surest means of making the diagnosis.

Hysteria shows no pyrexia and there will be found hysterical stigmata with the characteristic disturbances of sensation, such as glove and stocking anesthesia, or hemianesthesia. The reflexes are normal and there is no true paralysis.

Brain tumor may cause some difficulty; the vomiting and headache coming on in spells are the most suggestive things, and the changes in the eye grounds are apt to be very much more intense than those that are occasionally seen in encephalitis. Tilney and Howe give the absence of optic atrophy and of papilledema as means of differentiating the two, but there are unquestionably cases of encephalitis showing changes in the eye grounds.

Acute dementia shows no stupor nor pyrexia, but a persistent maniacal delirium.

The diagnosis of encephalitis from diseases accompanied with stupor or somnolence may present very great difficulties. In addition to the disease already referred to, one should bear in mind that such infections as malaria, mumps and influenza should be carefully excluded, and also pellagra. Froment has called attention to the fact that certain intoxications, especially those by veronal, might lead to a mistaken diagnosis.

THE PROGNOSIS. This varies considerably, both as regards recovery without any unpleasant sequelæ and as regards death. I believe, taken all in all, the fatal cases will be found to be about 30 per cent. This can be expected to vary, both in different places and at different times in the epidemic. Carroll and Nesbitt reported 23 per cent. mortality; Simerling 35 per cent.; and all of the figures run between 20 and 40 per cent.

As regards the form of the disease and prognosis, there is considerable difference of opinion. Lhermitte, Sicard and others regard the myoclonic form as having the worse prognosis, but Froment and some others are of the opposite opinion. The former opinion reminds one of the Hippocratic aphorism: "Trembling in lethargus is bad."<sup>108</sup> Theophilus, the Commentator, states that "lethargus is attended with a low fever and a disposition to be roused." Galen also mentions a lethargic fever in which there were trembling of the hands, involuntary stools, very great weakness with persistence of the intelligence. Somewhat similar references may be found in Coelius Aurelianus, and in the writings of Aretæus the Cappadocian. A high-continuing temperature is pretty generally regarded as meaning a bad prognosis, and Guillain regards the general abolition of the tendon reflexes to have the same import. Chalié believes that a very definite lymphocytosis means a bad end; and other

<sup>108</sup> Adams edition, VIII, 8.

signs which have been regarded as of value in judging the probable outcome of the disease are the replacing of the stupor by an excitability which is true also of the prognosis in poliomyelitis. Tachycardia, and rapid respiration without dyspnea, have also been noted in cases in which there was a fatal outcome. The cases in which there is marked psychosis and epileptomaniacal manifestations are liable to die, while the lethargic type, and particularly when catalepsy is present, may be regarded to have the best prognosis. When there is evidence of descending involvement of the pons and medulla, the prognosis is bad, as the vital centers are liable to be involved and here again the prognosis parallels that of poliomyelitis.

TREATMENT OF EPIDEMIC ENCEPHALITIS. Netter<sup>109</sup> has made a contribution on this subject. He believes that in France the disease was very much more widespread than was ordinarily thought, and he fixes the number of cases occurring in Paris at about 1500 and about 10,000 for all of France. He has studied four different methods of treating the disease.

The first is the *intraspinal injections of serum* taken from individuals who had previously had the disease. This method was also tried in Paris by a certain number of physicians, including Léri, Sicard, Achard and Weil. Some of these observers were encouraged by the results, but Netter does not believe that at the present time this method of treatment can be recommended.

The second method is the administration of *hexamethylenamin* by mouth and he has used it in the treatment of his cases, and although he states that he is not able at the present time to state what measure of success this form of treatment has met with, he does not hesitate to recommend it. He believes that very much better results will be obtained by using solutions of the drug intravenously after the method suggested by Loeper, and which has been used by Ewart for general infections. I think that one should use hexamethylenamin with a considerable amount of caution, as Abt and others have shown that nephritis can very easily follow the use of too large doses or for too long a time.

Knowing the effects of arsenic and of antimony in certain parasitic diseases, Netter was tempted to try these drugs on cases of encephalitis, but having information of a case in which injections of neosalvarsan exerted a baneful influence, he does not believe it should be recommended. He used tartar emetic in two cases, but without any effect.

The third method was the administration of *jaborandi* or *pilocarpine* with an idea of hastening the elimination of the virus. In 4 cases suffering with encephalitis he noted a marked swelling of the parotid and submaxillary glands, and in a large number of others he noted an increase in the secretion of saliva. At the same time that the *jaborandi* was administered, adrenalin was also given to oppose the depressing action on the heart and to combat the asthenia. Unfortunately, Netter does not state whether the drug had any marked effect on the course of the disease or not, but one may infer that it did not influence it.

<sup>109</sup> Bulletin de l'Académie de Médecine, No. XIII, March 30, 1920, p. 303.

The fourth method of treatment is the *injection of turpentine*.<sup>110</sup> In all of his patients in whom the grave forms of the disease were met with, one or two centimeters were injected as soon as possible in the external side of the thigh with the idea of obtaining the formation of an abscess. He believes that in the last epidemic of influenza, this procedure saved many lives and that its effects were not less remarkable in encephalitis. Of 27 patients in whom they used it, in 19 they obtained an abscess which could be incised. Only one of the patients died, and this was a woman who was three months pregnant. In 13, the cure was definite, but most of these cases seemed beyond hope. The 5 who resisted this method of treatment eventually gave good results. Fourteen of the 19 cases mentioned above were suffering with the myoclonic form of the disease which is supposed to be the exceedingly fatal form. In this connection, Netter states that Hippocrates was familiar with lethargies and knew the favorable significance of abscesses, basing it on the quotation that "the patients who escaped lethargies are generally taken with an empyema." It should, of course, be borne in mind that the Hippocratic empyema was merely a collection of pus without reference to its location. This method of treatment is a curious reversion to the methods of former days. The seton as a method of treatment is still used in veterinary surgery and I have myself seen patients in which a piece of string had been passed under the skin and pulled back and forth with the idea of superinducing suppuration with a view to ameliorating the condition of patients suffering with severe nephritis. We may confidently await the use of vomits, purges, sweats and bleeding. This recalls the merry quip of Lettsom:

"When patients comes to I,  
I physicks, bleeds and sweats 'em;  
Then—if they choose to die,  
What's that to I—I lets 'em."

Klebs<sup>111</sup> states that the treatment suggested by Netter has been widely used. This consists of giving intravenous injections of hexamethylenamin to the extent of a gram to a gram and a quarter a day, or else administering the drug by mouth, using with these injections repeated lumbar punctures so as to favor the passage of the drug through the choroid plexus. He does not give the results of this method of treatment which probably will be found to be without any value whatever.

*The Use of Diphtheria Antitoxin in Encephalitis.* There is an article by Capizzano<sup>112</sup> on this subject which a few years ago would have been quite unworthy of any serious consideration. While one would not be inclined to pay too much attention to the suggestion, it cannot be dismissed cavalierly as it would have been before the question of specificity of immunization had been raised. I gave some interesting facts concerning this subject in my review in *PROGRESSIVE MEDICINE* last

<sup>110</sup> Bull. de l'Académie de Médecine, Paris, April 6, 1920, p. 329.

<sup>111</sup> La Semana Medica, Buenos Ayres, May 13, 1920, p. 646.

<sup>112</sup> La Semana Medica, August 5, 1920, p. 182.



year, in commenting on the lessons of the war as interpreted by Wright, and would also refer the reader to the section in this review dealing with Goodman's treatment of chorea.

There is no doubt that there is some relation between the introduction of foreign substance into the spinal canal, possibly specific or partly so, on the course of some of the diseases in which the nervous system is involved. Capizzano's patient was a child sixteen months of age. The child has been ill for something over a month, was profoundly asleep with slight rigidity of the neck and contractures of the right arm and leg. There was a constant convergent strabismus of the left eye and the eyelids were moved with difficulty. A lumbar puncture was done and the cerebrospinal fluid was reported as normal chemically. There was no note made on the cell count. This puncture had no effect on the symptoms, so 15,000 units of antidiphtheritic serum were injected. This was following the suggestion of Boni,<sup>113</sup> of Florence. Five or six hours after the injection the child began to wake up and was more easily aroused by external stimuli. On the following day the symptoms had practically disappeared, there being only a slight ptosis and some strabismus of the left eye. The eye symptoms disappeared within a week. One is left somewhat in doubt as to whether the injection was given intraspinally or subcutaneously in this particular case, but one presumes that the subcutaneous route was used. It would be well worth while to try the procedure of Goodman mentioned above in epidemic encephalitis, particularly the more severe forms.

**Encephalitis and Myelitis Caused by a Trypanosome.** The disease called *Chagas* is due to the *T. Cruzi*, which is found in various parts of Brazil, and presents a form in which there is a predominance of disturbances in the nervous system. Some studies have been made on this by Torres and Villaca.<sup>114</sup> They studied the disease as it is produced experimentally in dogs. The lesions so produced are either a myelitis or an encephalitis, and these are characterized by numbers of foci localized by preference in the white substance of the cord and brain. These foci are composed of hypertrophied neuroglia cells, other cells of nervous origin and more or less numerous plasma cells. The meninges are not involved, although occasionally there is an accumulation of cells around the vessels of the pia mater. The trypanosome is found in many of the foci of encephalitis and myelitis, and sometimes in the other nervous tissue.

As far as I know, this disease has not been imported into the United States as yet, although it is highly probable that in view of the increasing commerce between the two countries, isolated cases will be observed sooner or later.

**Skin Tests in Echinococcus Infections.** Pantano<sup>115</sup> reported before the Royal Academy of Medicine at Rome, results of his researches in this direction. He used both subcutaneous and intradermic injections of the fluid from hydatid cysts and showed that it contained an antigen

<sup>113</sup> Gazzetta degli Ospedali e delle Cliniche, April 1, 1920.

<sup>114</sup> Memorias do Instituto Oswaldo Cruz, 1919, xi, 80.

<sup>115</sup> Il Policlinico, Sezione Pratica, August 9, 1920, p. 868.

for the human body. The fresh fluid was used in tests in from 0.20 to 0.30 for the intradermic reactions and in 1 c.c. for the subcutaneous reactions. The cutaneous reaction in patients with echinococcus infections with non-suppurating cysts gives a positive test in almost every instance. When the cysts are suppurating, the percentage of the positive reactions is lower.

Further researches along this line and the possibility of using injections of fluid in the matter of treatment may be looked for with a very considerable amount of interest, although the question of hydatid cysts is not one of as much importance in America as it is in Europe.

These reactions have been studied since their application to this disease by Casonia in 1912. Various other methods of diagnosis have been suggested; the precipitin reaction has been reported by Joest. This consists of studying the reaction taking place between the hydatid fluid and the blood serum of a person affected with the disease. The results were, for the most part, unsatisfactory. The meiostagmin reaction of Ascoli has given good results, according to studies made on infected animals, but does not seem to be entirely satisfactory in its application to human beings, besides requiring a very exact and rather difficult technic. The application of the Bordet-Gengou phenomenon to the disease has been studied by numerous observers, including Ghedдини, Zapelloni and Puntone in Italy; by Gallart-Mones and Chodinski.

Among the most recent reports is a discussion by Gasbarrini.<sup>116</sup> While Ghedдини has ordinarily been given the credit for the reaction by some and Weinberg and his associates by others, Apphati and Lorentz,<sup>117</sup> in a long article reviewing the whole subject, claim to have made the first communication in October, 1908, and they believe that they are entitled to the credit for inaugurating this diagnostic method. They state that Ghedдини's observations were made on only 3 patients. They were post-operative and he did not fix any technic, while they claim that they themselves described a definite technic which after twelve years was only susceptible to one modification, that they have applied it systematically in the diagnosis of echinococcic disease and that their observations have been sufficiently numerous to demonstrate that it is of great value in diagnosis and is a satisfactory test.

**A New Dermatitis Due to a Filaria.** Montpellier and La Croix<sup>118</sup> have given an account of an infection in which they suggest the name filarial itch (Gale Filarienne). In 1875, O'Neill described an affection in the African negroes under the name of *craw-craw*. This consisted of a papillopustulous itching eruption, somewhat resembling ordinary itch. He found in the skin of six patients the embryo of the filaria. His observations were never confirmed. The authors in question had occasion to examine many forms of this itch in the African troops in France and in Algeria. The skin is leathery, the change is especially marked on the trunk, the buttocks and lower part of the back. Sometimes the skin is very much thickened. In some places it seems to be

<sup>116</sup> Il Policlinico, Sezione Medica, December, 1919, p. 441.

<sup>117</sup> La Semana Medica, September 2, 1920, p. 303.

<sup>118</sup> Presse Médicale, September 1, 1920, p. 607.

somewhat thinned out. There are also little chains of flat papules suggesting lichen in appearance. There was a considerable amount of scarring and in some cases vesicles were encountered. All this was accompanied with intense itching.

It was found that this skin condition was caused by the invasion of it by the embryo of the *onchocerca volvulus*. These organisms were quite numerous and sometimes were found three or four in the same microscopic field. They were about 8 microns in diameter and about 40 microns long. The organism was not found in the blood, but evidently thrived in the lymphatic vessels, causing fibrous subcutaneous cysts and also swelling of the lymph nodes. The treatment is not very satisfactory at the present time. Injections of the arsenic preparations did not give very brilliant results. Most attention was paid to killing the adult filaria by cutting out the subcutaneous nodules or destroying them by injections of various kinds of liquids.

**Treatment of Giardia (Lamblia) Infections with Neoarsphenamin.** Various methods of treatment of infection by the *Giardia intestinalis* have been suggested. Ipecac, sulphur, emetine, and other drugs used for combating parasites in the intestinal tract have been tried by various observers. The organism has been recently described as the cause of trench diarrhea from which a large number of overseas troops suffered and from which a number of the returned troops are still suffering. Carr and Chandler<sup>119</sup> report a case occurring in a young soldier who had more or less continued abdominal pain and an intermittent diarrhea. Emetine treatment resulted in the disappearance of some *Endameba histolytica* in the stools, but had no effect upon the Giardia. Sulphur was used with some effect on the organisms, but none on the general condition of the patient. A single injection of 0.6 grams of neoarsphenamin was made intravenously. This gave remarkable results; the cysts of the organism were greatly reduced in number in the first sample after the first injection and were not found in the stools for six days after the treatment and have not been noted since. Three subsequent injections of the drug were given with the result that the patient's condition was greatly improved, the stools became normal and the abdominal discomfort disappeared.

**Granuloma Inguinale in the United States.** This disease is a chronic ulcerative lesion of the inguinal region, occurring both in men and women and which may involve the external genitalia and the inner surface of the thighs and the contiguous tissues. Symmer and Frost<sup>120</sup> have reported 2 cases seen in the United States. Heretofore it has been regarded as a disease which is endemic in many tropical countries, but not in all, as for example it is not found at all in certain of the West Indian Islands, but is widely found in the British Guiana. It is particularly liable to affect the negroid peoples and Indians, and the disease presents certain differences as it occurs in the different races. It has been regarded as an infection of venereal origin and in other places it is regarded as an independent disease. The ulceration which occurs may

<sup>119</sup> Journal of the American Medical Association, May 22, 1920, p. 1444.

<sup>120</sup> Ibid., May 8, 1920, p. 1304.



involve extensive areas of skin and usually persists for years, although occasional spontaneous healing does occur. The cause of the disease is not definitely determined, although Donovan, as early as 1905, described certain cell inclusions which were subsequently studied by Walker,<sup>121</sup> who regarded them as small incapsulated bacilli belonging to the Friedländer group.

Symmers and Frost found similar intracellular bodies in the 2 cases which they describe. One of their cases was a negro, aged twenty-nine, from Georgia, who stated that he had never been out of the United States and the second was a negro aged twenty-six, who also had never been out of the country. The disease is generally regarded by physicians in the tropics as due to some organism related to the *Leishmania* and the intravenous use of tartar emetic has been recommended as a cure. The second case reported by Symmers and Frost was greatly improved by repeated injections of neoarsphenamin, but the patient left the hospital against advice before the cure was complete. Their first patient died.

**A New Species of Hookworm.** The hookworm is a lucky little parasite in that he only uses three aliases: *Ankylostoma*, *Uncinaria*, and now, *Necator*. There may have been an attempt on the part of some authors to restrict the use of these terms, but they are pretty generally interchangeable unless we except the *Necator Americana* being used exclusively for the American type. Parodi<sup>122</sup> has described a new species which he has found in southern Brazil and in certain districts in the Argentine. The organism is pathogenic and, as far as its effects are concerned, they are the same as the ordinary hookworm, but the worm has certain distinctive characteristics by which it may easily be differentiated. Parodi suggests the name *Necator Argentinus*. The differential characteristics consist in a difference in the conformation and structure of the buccal capsule and the caudal ampulla. One of the chief differences is the presence of two lateral papilla in the cuticle a little distance from the head end, and this is noted in both sexes. It would be interesting to learn whether this species is peculiar to South America or whether, now that attention has been called to it, it will be found in other places.

**Influenza.** CHANGES IN THE BLOOD IN INFLUENZA. During the influenza epidemic nosebleed, bloody sputum and hemorrhagic character of the lesion of the lung gave rise to the inference that there are changes in the blood which give rise to this hemorrhage. Kinsella and Broun<sup>123</sup> have made a study of this subject and published their preliminary report. They found that the clotting time of the blood of patients with influenza is definitely delayed, and the study of platelets showed that the number of platelets was reduced, both of these features being apparently independent of the number of leukocytes present, and it is well known that there is usually an absence of leukocytes extending to the degree of leukocytosis, although the number of leukocytes is usually regarded as some evidence of secondary infection. The fragility of the red cells, they believe to be increased in influenza.

<sup>121</sup> Journal of Medical Research, January, 1918, p. 247.

<sup>122</sup> La Semana Medica, February 5, 1920, p. 177.

<sup>123</sup> Journal of the American Medical Association, April 17, 1920, p. 1070.

INFLUENZA AND PNEUMONIA. Any one interested in the subject of influenzal pneumonia will be interested in the articles of E. C. Rosenow, studies No. 5 and including 11, occupying the whole of the *Journal of Infectious Diseases* for June, 1920. He has studied the effects and characteristics of the green-producing streptococci, the hemolytic streptococci and gives a short, but well selected, bibliography of this subject. Study No. 6 deals with the leukocytic reaction in influenza and influenzal pneumonia, particularly studied in animals under observation. Study No. 7 is a rather extensive study of the results obtained from the injection in various ways in animals of material obtained from patients with influenza and influenzal pneumonia and from sources other than influenza, and gives the gross and microscopic changes so produced and the comparison of these changes noted in the epidemic of 1918 and 1919.

Rosenow believes that he has been able to produce by injections by several different methods, but particularly by the intratracheal route, the picture of influenza as seen in man. The symptoms of influenza and influenzal pneumonia have been closely simulated in mice, and the gross microscopic changes, which have come to be regarded as characteristic of influenza, have been produced. The various clinical pictures, such as leukocytosis, as evidence of pleural involvement and purulent infection, have been noted in guinea-pigs injected intratracheally with certain streptococci. The tendency to involvement of the female generative organs and the high mortality in pregnancy, the high incidence of abortion, of lesions of the heart, abscess in the rectus muscles and interstitial emphysema have been noted in the animals quite as they occur in man.

His observations with the green-producing streptococcus in influenza are verified in study No. 9. He found that the virulency and mortality in animals increased in one or two intratracheal injections and on further animal passage progressively diminished. When most virulent, the symptoms of respiratory embarrassment are most violent, cyanosis and leukocytosis most marked and death takes place from the lungs filling up with a hemorrhagic edematous fluid. He believes that this evidence, which occupies a large article and which has been condensed into a few sentences, explains the change in the type of the disease early and late in the epidemics, the rise and fall of the rate in the same epidemic, the virulence of different epidemics, and the lesser tendency to leukopenia late in epidemic waves, which he believes may be due to changes in the virulency and other properties of this green-producing streptococcus. He cautiously states that these facts do not exclude the possibility that the influenza bacillus may play a role in the production of symptoms and lesions in influenza. One of his most interesting observations is that there were well-marked examples in which the green-producing streptococci suddenly developed hemolytic power, and, on the other hand, hemolytic streptococci suddenly became green-producing streptococci, both *in vitro* and *in vivo*. This he believes explains the complete or partial displacement of one type of streptococci by another throughout and especially late in epidemic waves, and that this may be due to the

development of mutation forms rather than as a result of superimposed infection through the upper respiratory tract. He makes the suggestion, since these organisms showing these mutations have been found to possess the power of producing the characteristic lesions in the lung and a sharp leukopenia on intratracheal application, that the green-producing streptococcus isolated so constantly early in influenza and in influenzal pneumonia may be a mutation form of the pneumococcus streptococcus group so frequently found in the normal human being. He also believes that this might explain the sudden appearance of influenza among isolated groups and almost simultaneously over wide areas. A fascinating suggestion and one which means if this is so we shall have to look for cosmic or other influence affecting individuals as regards their immunity reactions and bacteria as regards their virulence, and I venture to make the prediction that ere long, if it has not already happened and escaped my eye, there will be articles from serious thinkers dealing with the effects of the various planets or stars on the epidemics occurring on the earth; in fact a return to some of the ideas of earlier and possibly less favored centuries, and this will be another evidence of the tendency of the human mind to work around in circles. Some author, whose name I fear to mention lest I be in error, has said that "all life is a circle, in which the present presses on the future, the future on the past."

Study No. 10 deals with the immunology of the disease as studied in animals from organisms obtained in the epidemic. He has demonstrated that the green-producing streptococcus noted at the outset of the epidemic and noted so constantly since, both in influenza and in influenzal pneumonia are immunologically homogenous to the mutation forms which develop *in vitro* and *in vivo*.

Study No. 11 deals with the therapeutic effects of a monovalent anti-streptococcus serum in influenza and influenzal pneumonia, but the number of cases in which it was used were far too few to commit one to draw any conclusions, although Rosenow believes that he has evidence that it may prove of value.

ACUTE ALVEOLAR AND INTERSTITIAL EMPHYSEMA IN INFLUENZAL BRONCHOPNEUMONIA. Reckord<sup>124</sup> has made a report on this subject from studies made in the influenza epidemic at Camp Devens, Massachusetts, during the fall of 1918. He describes a striking picture, which is noted frequently, in which there was a condition of acute alveolar emphysema with a deposit of hyalin fibrinous material on the alveolar walls. The intervening alveoli are compressed and filled with exudate which, in the early stages, is serous or slightly bloody, containing but little fibrin. This he regards as the one distinctive feature of the pathology of influenzal pneumonia. In addition to this, there is interstitial emphysema, which Reckord believes takes place where the greatly distended alveoli are in contact with the pleura or interlobular septa. In these locations it is possible to demonstrate the rupture of the alveolar walls and the direct continuity of the fibrinous strands, partially filling clefts dissected by the air into alveolar or pleural connective tissue. The

<sup>124</sup> Pennsylvania Medical Journal, April, 1920, p. 379.



air finds the easiest route of exit from the lung in the connective tissue surrounding the bloodvessels and from there along the bloodvessels and bronchii into the mediastinum, over the pericardium into the anterior mediastinum and upward along the trachea into the tissues of the neck, whence it escapes into the subcutaneous tissue. This subcutaneous emphysema may appear very early, but the average was noted on the tenth day from the initial symptoms of the disease. The duration of the subcutaneous emphysema was variable, lasting from five to forty-eight days, the latter being in one case of generalized emphysema where the palms of the hands and the soles of the feet alone escaped.

*Subcutaneous Emphysema as a Complication of Influenzal Pneumonia.* Meyers and Lucke<sup>125</sup> have made a study of this subject with an experience of 9 cases, 7 of which were carefully studied. In about 3000 cases in influenzal pneumonia subcutaneous emphysema occurred in about 0.3 per cent., and in another series of 12,000 cases of influenzal pneumonia in only 0.07 per cent. I noted last year in my review in *PROGRESSIVE MEDICINE* the observations of Clark and Synnott. There have, in addition, been 3 cases reported by Symmers,<sup>126</sup> 11 by Berkley and Coffen,<sup>127</sup> while its appearance has been mentioned by Blanton and Irons and by Stone and Swift.

Meyers and Lucke have naturally come to the conclusion that subcutaneous emphysema is an exceedingly rare complication of influenza. The onset of the subcutaneous emphysema was apparently sudden, but after its appearance the gas spread relatively slowly, attaining its greatest extent in twenty-four to forty-eight hours. The time of the appearance of the emphysema, relative to the stage of influenzal pneumonia, was not definite, but in the majority of cases it developed when the pneumonic process was well advanced. The symptoms associated with the development of subcutaneous emphysema, according to the experience of Meyers and Lucke, were negative. The patient was generally not aware of the complication until it was pointed out to him, while the pulse and temperature showed no change. Precordial pain was observed in one case and pleuritis pain was common. The emphysema occurred most frequently in the neck region, but in one case it was first noticed in the region of the second left intercostal space. In addition, various other parts of the body were involved, as the supraclavicular spaces, neck, chest, face, extremities, abdomen and scrotum. The diagnosis is easily made by the fine crepitation produced by palpation and the crackling heard on auscultation. The condition gradually disappears without the necessity of any treatment.

**ETIOLOGY OF INFLUENZA.** Olitsky and Gates<sup>128</sup> have made some studies on the nasopharyngeal secretions of influenza patients during the course of one and a half years. They found that there occurs a specific substance in the nasopharyngeal secretions in cases of uncomplicated influenza. This substance seems to be present only in the early hours of the disease and is not found later than thirty-six hours after

<sup>125</sup> *American Journal of the Medical Sciences*, March, 1920, p. 417.

<sup>126</sup> *Journal of the American Medical Association*, 1918, lxxi, 1482.

<sup>127</sup> *Ibid.*, lxxii, 535.

<sup>128</sup> *Ibid.*, May 29, 1920, p. 1497.

the onset, nor in cases of secondary pneumonia, nor in secretions from persons free from the syndrome of influenza, either during the epidemic or during non-epidemic periods. With this substance they have induced a pathologic condition in rabbits, mainly affecting the blood and pulmonary structures which could be maintained and carried through at least fifteen successive animals. The period of incubation from rabbit to rabbit is shortened. From this and the fact that the substance could be carried through so many successive animals they have been led to the conclusion that they are dealing with the actual transmission of a multiplying agent rather than with a passive transference of any original active substance. The substance in question is filtrable and resists the action of sterile 50 per cent. glycerin for nine months, but probably not for a much longer period. They believe that such bacteria as the pneumococcus, Pfeiffer bacillus, *Streptococcus viridans* and others encountered during transmission experiments are secondary and the essential effects produced by this substance is wholly unrelated to these bacteria. During the course of their observations they have seen in cultures, both from the lung tissue of affected rabbits and in the filtered nasopharyngeal washings from cases of influenza, tiny bodies, almost invisible, which decolorize by Gram's method and which stain with difficulty with nuclear dyes.

**Measures Adopted for the Control of Epidemic Influenza.** Feezer<sup>219</sup> has made a comparative study of the state regulations for the control of influenza and an extensive discussion will also be found in an article by W. H. Kellogg, *Influenza: A Study of Measures Adopted for the Control of the Epidemic* (published by the California State Board of Health, 1919). There is very great divergence of practice of practically all features of the control of the disease. The first thing that strikes one is that 97.5 per cent. of the states considered in Feezer's article require some system of reporting. In 74.4 per cent. the reports are made to the local health officer and to the state health officer in 12.8 per cent. and to the local officer as well. In 92.3 per cent. the report is made by mail.

The question of quarantine and isolation, of course, is one of the most important features. By quarantine is meant the separation of the patient and all others in the household and prohibiting others from leaving or entering the premises. By isolation is meant that the patient is separated from all other persons but all other members of the household, provided that they have no contact with the patient may come and go without restriction. In twenty-four states either quarantine or isolation is maintained. In about 20 per cent. of these isolation or quarantine was kept up until recovery from all clinical symptoms, and in another 20 per cent. until five days after return to normal temperature. In some, no time is fixed, and in one state they have the extraordinarily onerous detention of fourteen days after the return to normal temperature. This state is Colorado, certainly a bad state to have influenza in, although by decree of the same authorities a good state in which to die of it, as public funerals are not forbidden, so that mourners could easily

<sup>219</sup> Public Health Reports, September 10, 1920, p. 2155.

congregate in the places of infection. Quarantine for ten days after a normal temperature was the rule in Vermont, and public funerals were prohibited, while Wyoming insists on a ten days' detention without stating whether it is isolation or quarantine. Inasmuch as we know nothing whatever, or practically nothing, of the length of time an individual having influenza is liable to transmit it, high-handed action on the part of state authorities is to be condemned.

Placarding is practiced in 35 per cent. It would seem that placarding in an influenza epidemic comes under the same class of joking as carrying a piece of paper called a permit did in the foolish and futile attempts to control the poliomyelitis epidemic in 1916. As a general rule, in times of epidemics placards are some days late in getting up and serve more as a source of irritation than a warning. The most infectious time certainly in the disease is early, and the greatest danger is already passed before the notice is posted.

In the matter of public funerals the practice is fairly equally divided.

As to the use of serum, it is clear the Public Health authorities are unwilling to take the responsibility of making any recommendations whatever, an evidence of wisdom not shared by the Kentucky officials.

In regard to closing public places in time of epidemic there is a tendency to shift the responsibility to the local health authorities, where, it would seem to me, the responsibility properly belongs. The only trouble is that there is a growing inclination to the view that closing is useless which local authorities often do not share. Anyone with half an observing eye who went through the recent epidemic is perfectly certain that the closing did nothing in stopping the number of cases. Whether it slowed down the progress of the epidemic a little, or not, is, perhaps, open to question. It would seem that in the present state of our knowledge of infectious diseases, health departments should act more sensibly than they usually do. In place of promptly refusing the adoption of measures that are useless or questionable, they usually yield to public opinion and make regulations which are expensive and burdensome and which lead to the hiding of infectious diseases and to the breaking of the foolish rules.

**INFLUENZA AND TUBERCULOSIS.** The recent pandemic of influenza brought out a large number of studies of various kinds, among others one on the subject of the disease and tuberculosis. Fishberg and Boaz<sup>130</sup> have studied the outbreaks that occurred at the Montefiore Hospital in 1918, and also an outbreak in January and February, 1920. The portion of individuals affected was about the same as might have been expected among non-tuberculous individuals. There did not seem to be any relation between the form of tuberculosis and the stage of the disease and the liability to contract influenza.

The clinical course of the disease was essentially that as seen in ordinary individuals, but there seemed to be a distinct tendency to develop bronchopneumonia and at a very much greater rate than among the non-tuberculous. Thus, in 28 patients with influenza, 22 developed bronchopneumonia.



The mortality was also greater, but, curiously enough, in nearly all of the patients who recovered the complicating disease had no appreciable influence on the tuberculous lung lesion so far as could be ascertained by physical exploration of the chest or by subsequent course of the disease. In the epidemic of 1918, the tendency to develop bronchopneumonia was distinctly less than in 1920. There has been no increase in the morbidity or mortality from tuberculosis and, as a general rule, tuberculous patients have stood the disease very well and, in fact, the proportion of fatal cases is apparently even smaller than among the non-tuberculous. This has been especially true where observations have been made on large numbers of cases. Gerwiener<sup>131</sup> has reported the experiences in a Hungarian military sanatorium of 2400 beds. No precautions were taken to keep the disease out of the institution or to isolate the patients, but very few cases occurred among the tuberculous patients, although the non-tuberculous personnel of the sanatorium suffered severely.

Bochall<sup>132</sup> believes that tuberculosis created a certain degree of immunity against influenza and thought the prognosis of patients when affected was better than in the non-tuberculous. Wurtzen<sup>133</sup> noted that the chances of contracting pneumonia were about the same in the tuberculous and non-tuberculous individuals, but though the mortality in the tuberculous was very markedly increased, being 36 per cent. of previously healthy soldiers and 83 per cent. in the tuberculous. Weil<sup>134</sup> reports two wards of tuberculous patients that escaped entirely and Britcaire during the influenza epidemic found every ward infected in the Boucicaut Hospital except the tuberculosis ward.

The antagonism of the two diseases does not seem to be perfectly clear, but rather that for some reason the tuberculous individuals are partly immune to the disease, as is evidenced by the lessened morbidity and mortality except in cases where the lungs are involved by an influenzal pneumonia, in which case the mortality is high, as might be expected.

**Epidemic Acute Hemorrhagic Jaundice of Toxic Origin.** The numerous recent reports on the subject of epidemic jaundice render the report of Symmers<sup>135</sup> of particular interest. He observed that during a period of ten weeks commencing the middle of December, 1916, 16 patients were admitted to Bellevue Hospital suffering from a variety of acute hemorrhagic jaundice. Of these, 9 died, a mortality of 56.2 per cent. Clinically and anatomically the disease presented features which, on the one hand, were strikingly similar to those of infective jaundice and yellow fever, and, on the other, to acute yellow atrophy of the liver. In 8 of the 16 cases unsuccessful attempts were made to find spirochetes in stained films of blood taken from living patients, and observations on

<sup>131</sup> *Beit. z. Klin. d. Tuberkulose*, 1919, xlii, No. 33.

<sup>132</sup> *München. med. Wehnschr.*, 1919, lxvi, No. 12.

<sup>133</sup> *Ugeskr. f. Laeger*, 1919, lxxi, 673, quoted by Fishberg and Boaz.

<sup>134</sup> *Contribution à l'étude de la grippe chez les tuberculeux pulmonaires*, Thèse de Paris, 1919.

<sup>135</sup> *Journal of the American Medical Association*, April 24, 1920, p. 1153.

guinea-pigs failed to reproduce the disease, nor could any spirochete be found in the material obtained at necropsy.

In 3 patients the liver was examined for heavy metals, and particularly for phosphorus, but the results were all negative. From these observations Symmers concludes that there is a variety of epidemic jaundice with a high mortality attended by spontaneous or easily induced hemorrhages and the other signs and symptoms common to severe jaundice. All of the cases were in male patients. In the younger ones there was more or less violent mental disturbance, and in the more prolonged ones, stupor. The association of intense jaundice with clay-colored stools, pain and tenderness in the region of the gall-bladder and liver would occasionally prompt surgical intervention, so that the knowledge of the disease from this standpoint is valuable. The occurrence of the disease in epidemic form should lead to extreme caution in the interpretation of these symptoms. The cause of this form of the disease is as yet undiscovered.

**The Treatment of Leprosy with Chaulmoogra Oil.** From the earliest times leprosy has been looked upon as an incurable disease. In 1906, Unna, speaking before the Section of Dermatology at the Fifteenth National Congress of Medicine held at Lisbon, made a statement that has been frequently quoted: "The time has happily passed when the universal opinion that leprosy is incurable and when every physician who did not allow himself to be tyrannized by this desolating dogma received only a charitable smile. Leprosy is making its way on the same ground as tuberculosis, and it is only the persistent and faithful work of a few physicians who were not satisfied with that easy-going doctrine that has brought about the hopeful change."

McDonald and Dean<sup>136</sup> have contributed an article showing the advances that have been made in recent years. Leaving apart the necessity for looking after the general welfare of the patients, of food, dormitories and personal cleanliness, occupation and diversion and the general treatment by tonics and local methods for relieving skin irritations and ulcers, they come down to the question of the various drugs and preparations that have been found of value. As heretofore, the remedy superior to all others is chaulmoogra oil. In *PROGRESSIVE MEDICINE* in March, 1915, I commented on the observations of Heiser and his use of the oil intramuscularly, using it at weekly intervals in ascending doses. His formula was chaulmoogra oil, 60 c.c.; camphor, 60 c.c.; resorcin, 4 grams. These are mixed together and dissolved with the aid of heat on a hot water-bath and then filtered. The initial dose was 1 c.c. and this was increased to the point of tolerance. Other observers use a mixture composed of chaulmoogra oil, 500 c.c.; olive oil, 500 c.c.; camphor, 5 grams; guaiacol, 5 grams. The drug was given both intramuscularly and by mouth. From the results of various studies it would seem clear to McDonald and Dean that in chaulmoogra oil there were one or more specific ingredients that had a specific action in leprosy and it also seemed true that this agent is more effective when introduced into the

<sup>136</sup> Public Health Reports, August 20, 1920, p. 1959.

body hypodermically than when taken by mouth. Crude oil was slow, injections were painful and absorption is delayed. In studies made at the Wellcome Laboratory by Power and his collaborators, it was found that in a new series of fatty acids represented by two members, chaulmoogric acid,  $C_{18}H_{32}O_2$ , and hydnocarpic acid,  $C_{16}H_{28}O_2$ , could be isolated from chaulmoogra oil. It seemed that good results obtained might either be due to the glycerides of the unique fatty acids of chaulmoogra oil or to the presence of some other constituents of fatty acid not a glyceride. The fatty acids of chaulmoogra oil have been separated into four fractions, all of which are solids, and before they could be injected it was necessary to dissolve them and it was found that the ethyl esters of the fatty acids were thin fluid oils which could be injected intramuscularly and were rapidly absorbed. Injections are given once a week, usually in the upper and outer quadrant of the gluteal region, alternating the sides weekly. One c.c. is given as the initial dose and at every second or third injection the amount is increased by 1 c.c. until the maximum of 5 or 6 c.c. is reached, according to the weight or age of the patient. As in using other preparations of chaulmoogra oil, these injections occasionally cause a violent fit of coughing coming on shortly after the injection, but subsiding within five minutes with no serious results. In some instances iodine was used in addition, chiefly in the form of Lugol's solution and it was found that iodine could be combined with the ethyl esters of chaulmoogra oil, the preparation containing 4 per cent. usually being used, but these varied from 2 to 8 per cent. The patients were also given three times a day, an hour and a half after meals, capsules containing the fatty acids of chaulmoogra oil with 2.5 per cent. of iodine chemically combined.

There is no established proof to show that iodine causes any increase in the effectiveness of the material used and it seems that the good results were obtained from the action of one or more of the fatty acids of the oil or to some as yet unidentified substance associated therewith. It also seems highly probable that the oral administration of the oil is of minor importance as compared with its use intramuscularly.

As an auxiliary treatment injections were also made into the leprosy nodules. Such treatment is followed by marked swelling with an ultimate recession of the lesions. Good results have also been obtained in the neural cases and sun baths and the local use of trichloroacetic acid were also frequently employed in some of the cases.

**Malaria.** ORCHITIS IN MALARIA. The Italians have always taken a very keen interest in the study of malaria and its various manifestations, so that their journals almost always contain articles dealing with some phase of the subject; this because malaria is an ever-present source of death and disease in various places in their country. Vecchia<sup>137</sup> has reported what he believes to be a case of orchitis due to the malarial organism. There are not very many reports made on this subject, but in general it has been regarded with a very considerable skepticism by such observers as Laveran, Ziemman, and others. In most of the

<sup>137</sup> Il Policlinico, Sezione Pratica, January 5, 1920, p. 6.



instances reported, there has been some doubt as to whether the swelling is not due to mumps, as there has usually been a concomitant swelling of the parotids. In Vecchia's case, he was able to exclude this disease, as well as gonorrhea, whereas there was no question of the presence of a severe estivo-autumnal infection. The orchitis disappeared promptly on using quinine.

**THE INJECTION OF ADRENALIN IN THE DIAGNOSIS OF LATENT MALARIA.** The diagnosis of latent malaria has been the subject of a very considerable amount of investigation and various suggestions have been made to bring the organisms into the superficial circulation. It is not uninteresting to note the large number of different procedures that have been tried by various clinicians: Grundman used hot baths, light baths, or exposure of the splenic area either to the roentgen or to the ultraviolet rays. Reinhardt suggested general radiation of the whole body with the ultraviolet rays. Sieber and Thaller suggested the intramuscular injection of sterile milk, while Brauer and Dorendor used injections of normal horse serum. Di Pace used strychnin, and others have suggested tuberculin, antityphoid vaccine, anticholera vaccine, and other things of the same nature. Various gland products have been tried, and also ergot. It has been found by Schittelen and Schlecht, and independently by Neuschlosz, that injections of epinephrin give the best results.

A study on this subject has been published by Dazzi.<sup>138</sup> He studied 20 cases carefully and concludes that the subcutaneous injection of 1 mg. of adrenalin does not cause a typical malarial paroxysm, but is constantly followed by the appearance of the plasmodium in the circulating blood. The presence of the parasite in the blood is transitory and begins about twenty minutes after the injection and reaches its acme in about one hour and has practically disappeared at the end of twenty-four hours. In cases in which the parasites were present before the injection it was found that they were greatly increased in number. The adrenalin causes a noteworthy diminution in the swelling of the spleen which may, however, not take place in cases that have had an enlarged spleen for a long period of time. This alteration in the size of the spleen commences a few minutes after the administration of the adrenalin and ceases after several hours.

**HEMIPLEGIA IN MALARIA IN A NURSING BABY.** Spolverini<sup>139</sup> has reported a remarkable instance of hemiplegia occurring in an eleven-months-old nursing baby, who was suffering with a malarial infection. He had had severe convulsions for several days and two days later the mother noticed that the right arm and leg were paralyzed, but a certain amount of movement was still possible. This was gradually recovered from, so much so that in about a month's time the only loss of power left was limited to the right arm. This may have been caused by a cerebral hemorrhage, encephalitis, thrombosis or embolus, and while the author discusses at very considerable length as to what the nature of the lesion might be, it seems to me it would be impossible to do more than make a clever guess at it. It is just likely that the lesion in the

<sup>138</sup> Il Policlinico, Sezione Pratica, November 30, 1920, p. 1413.

<sup>139</sup> Ibid., December 21, 1920, p. 1507.

brain causing the paralysis was due to the prolonged convulsion as much as to the presence of malarial organism or to toxemia.

A SCARLATINAL FORM OF ERUPTION IN MALARIA. There has always been more or less interest paid to the occurrence of rashes in malaria. Of course, most of the things taken as skin manifestations come under the head of coincidental or complicating skin conditions or rashes due to drugs that have been used in the treatment of the malaria. Those old giants of the study of malaria, Marchiafava and Bignami, and others of the Roman school, have described cases of herpes and morbilliform eruptions. Laveran, Barbarotta, Puccinotti and others have reported urticaria and petechia, while Torti, Lanzoni and others have described cases with a pustular exanthem. Erythema nodosa, pemphigus are also well known. Many of the scarlatiniform eruptions are undoubtedly due to quinine, but there are some records in which this does not seem to have been the case. Curiously enough, this question of scarlatiniform eruption goes back to very early days, and Morton, in his work on intermittent fever in 1696, describes a case that had such an eruption during the febrile attacks and which was cured by the use of the bark, and in another case he used the expression "the eruption simulating that of scarlet fever."

Of recent years, Marchiafava, Bignami, Moscato and Masucci have all described cases similar to scarlet fever with a diffuse rash all over the body, erythema of the fauces and extensive desquamation in large pieces. Tarascon<sup>140</sup> has reported an instance of an individual thirty-one years of age, suffering with malaria, but every day at eleven o'clock in the morning, when he had his chill, and at the beginning of the febrile period, presented a scarlatiniform rash slightly raised about the margins, and some isolated spots about the size of a lentil or somewhat larger. For the most part they had a tendency to be confluent and presented irregular forms and various shapes. This eruption lasted as long as the febrile attacks.

One of the recent reports is by Genoese.<sup>141</sup> His patient was a boy of six, living in a malarial region with other members of the family suffering with the same disease. He had a severe malarial infection, and was having a chill and sweat every day. On some days he had vomiting, intense headache, and rigidity of the neck, and a scarlatiniform eruption scattered on the face, but in sufficient evidence on the trunk, particularly the upper part, but not extending to the legs. The parents said that at the beginning of the febrile attack a week previous the child had the same eruption, but not quite as marked or covering as large a surface. The child was treated with injections of quinine and the eruption disappeared. The eruption itself was similar to that seen in scarlet fever, but in this case there was an absence of any manifestations in the throat. The rash was followed by a desquamation.

ACUTE MANIA AND PLASMODIUM VIVAX INFECTION. There are a few instances in the literature in which cerebral symptoms have occurred in the course of a so-called benign tertian fever. Four such cases have

<sup>140</sup> Il Policlinico, Sezione Pratica, 1909.

<sup>141</sup> Ibid., August 9, 1920, p. 858.

been reported from Macedonia by Wurtz and Van Malleghem.<sup>142</sup> Three of these patients developed violent delirium followed by unconsciousness. The other became cyanotic and unconscious following a period of vomiting. Hesse<sup>143</sup> reported two instances, one patient developing acute cerebral symptoms which culminated in delirium on the fourth day; the other patient had a chronic relapsing meningitis. Both patients died.

Haughwout, Lantin and Fernandez<sup>144</sup> report an instance of acute mania associated with plasmodium vivax. The parasites were present in the peripheral circulation in small numbers and the temperature was not high at any time. The interesting feature in this instance was that the patient had been given a treatment with the roentgen rays. Eight days later he developed a delirium and died four days later. It seems hardly probable that the roentgen rays had anything to do with the development of the delirium, inasmuch as this patient was the only one treated in this way so affected. Various observers who have used this method of treatment do not report any such mishaps, but Pais states his opinion that new generations of the parasite appear to display exalted virulence under the influence of the rays. If this be true, this might in some way account for the observation of these Philippine observers.

**EXPERIMENTAL INOCULATION OF MALARIA BY MEANS OF THE ANOPHELES LUDLOWI.** There has been doubt in the minds of some of the sanitarians in farther India as to the part played by *Anopheles ludlowi* in the causation of malaria on the coasts of the Peninsula of Malacca and Indonesia. In 1912, Christophers, in his studies in the Andaman Islands found the malarial zygotes in two out of fifty-three naturally infected wild specimens of *Anopheles ludlowi*, and found that the relation between the distribution of the species and that of malaria coincided. Watson, however, believes that the *Anopheles ludlowi* can exist without causing malaria, and he also believes that malaria will disappear from a place when only the *Anopheles umbrosus* has been exterminated, leaving behind large numbers of the *Anopheles ludlowi*. Strickland believes that the *Anopheles ludlowi* was the cause of malaria at Morib, Federated Malay States.

In order to throw some light on this subject, studies were undertaken by Darling<sup>145</sup> of the Rockefeller foundation. Without going into details of his observations, it may be stated that three persons were inoculated experimentally with malaria by means of the *Anopheles ludlowi* that had been reared from larvæ and infected with a pure strain of subtertian plasmodium (*Plasmodium falciparum*). This proves that there is no mechanical impediment to the free exit of sporozoites from the salivary ducts. On dissecting infected mosquitoes no evidence of degenerated zygotes were found. Sporozoites were found in the salivary glands in from nine to twelve days. The period of incubation in the disease so produced was fourteen to eighteen days.

<sup>142</sup> *Compte rendu de l'Académie de Science*, 1917, clxiv, 797.

<sup>143</sup> *Zentralblatt für Innere Medizin*, 1918, xxxix, 385.

<sup>144</sup> *Philippine Journal of Science*, December, 1919, p. 563.

<sup>145</sup> *Journal of Experimental Medicine*, September, 1920, p. 313.



The symptoms were more severe in the subject that had never been infected with malaria previously, while the splenic enlargement was greatest in the subject infected after a long interval of freedom from the disease. Darling therefore believes that considering the facility with which this species can be infected and man inoculated experimentally, the occurrence of naturally infected wild specimens, and the positive epidemiological evidence that there should no longer exist in the minds of sanitarians any doubt as to its being a malarial carrier. He believes that this species should be exterminated along with the other varieties of malaria-bearing mosquitoes.

**Measles.** FORDYCE'S DISEASE AS PSEUDO-KOPLIK SPOTS AND A CAUSE OF MISTAKES IN THE DIAGNOSIS OF MEASLES. Regan,<sup>146</sup> whose contributions to the journals are always interesting, calls attention to a source of error in the diagnosis of measles which is worthy of consideration. In 1896, Fordyce described, in the *Journal of Cutaneous Diseases*, the disease which has since borne his name and which has been defined as a chronic disease of the mucous membrane of the mouth and lips characterized by the presence of whitish or yellowish, scanty or abundant discrete, aggravated and often coalescent milium-like bodies, occurring more especially on the inside of the mouth, laterally along the line of the teeth as far back as the last molar, and possibly somewhat less frequently on the vermilion or mucous and inner surface of the lips. These bodies vary from pinpoint to pinhead size and are usually of pale buff color. There are no subjective symptoms and the patient is usually unconscious of the disease. While most commonly met with during the ages from twenty to forty, it has been observed in young children.

Regan has had several instances in which patients, usually older children or grown people, were sent into the hospital with an incorrect diagnosis of measles, the skin showing typical symptoms of German measles and the mouth failing to show Koplik's spots, but presenting the typical picture of Fordyce's disease. He also had an instance in which a child was admitted to the hospital with a mild scarlet fever in which a diagnosis of measles had been made by the family physician based, in part, on the pseudo-Koplik spots. Patients ill with other diseases have also been diagnosed as measles through the presence of Fordyce's spots, and children have been sent into the hospital with a diagnosis of laryngeal diphtheria or influenzal croup and have been isolated as possible beginning cases of measles with a catarrhal laryngitis, when the subsequent examination showed the suspected lesions to be a few Fordyce spots.

Errors may also occur when patients have maculo-papular rashes from the administration of serums or from other causes. In children, the spots may be limited in number, and occur as small discrete lesions situated well back on the buccal mucous membrane, often just posterior to the site of the last molar and visible only on careful inspection. These spots are persistent and last after the symptoms of any acute malady have passed away, while Koplik spots, of course, are transient. The

<sup>146</sup> American Journal of Diseases of Children, June, 1920, p. 455.

color of Koplik's spots is white with a surrounding red areola and as they become more numerous there may be a red background on which there are numerous milky white spots, at times somewhat coalescent. Fordyce's spots, on the contrary, are yellowish white or cafe-au-lait in color, they are larger than Koplik's spots, often coalescent and are in the superficial layers of the mucous membrane and without a definite areola.

The mistake would not be made often if one used bright daylight or sunlight in making the examination and not artificial light which, as everyone knows, is notoriously liable to cause mistakes in diagnosis when dealing with eruptions on the mucous membranes. Another illustration of the old saw that "colors seen by candlelight are not the same by day."

**BRAIN COMPLICATIONS IN MEASLES.** A study of this subject has been made by Skoog.<sup>147</sup> While it is well known that various complications are sequelæ referable to the nervous system occurring in measles, the literature of the subject is not particularly large. That paralysis could follow the acute fevers was known to Hippocrates, but Skoog states that the first allusion to measles in this connection was made by Olier in 1772, who referred to this disease as the cause of acute hydrocephalus. Allyn, in 1891, gave James Lucas credit for reporting the first case in 1790 in the *London Medical Journal*.

Skoog states that the brain complications and sequelæ of measles occur much more frequently in children than in adults, and during convalescence much more often than during the febrile and exanthematous stage, but this is as one would expect, as the incidence of measles in children is enormous while in grown people it is small. He reports two instances, one a case of cerebral symptoms which developed about the twelfth day, increased rapidly until the voluntary movements of the hands were so ataxic that she could scarcely hold and drink a glass of water, and the coördination in the legs was such that it made standing and walking quite difficult. The condition persisted for some days and about fifteen days from the onset great improvement was found and seven weeks later there was almost no trace of the clinical signs of involvement of the nervous system.

Skoog also reports a patient who developed a meningitis, but there was present with the measles a blocking bronchopneumonia and an otitis media followed. The spinal fluid was clear, there was no increase of cells and no bacteria were found. The patient's condition was exceedingly bad, but later there was some improvement up to the point of walking. She was unable to talk and at the time of the report movements were not perfectly coördinated. Skoog made an analysis of the reported cases and suggests three groups and makes the following comment:

"1. The first group would include a certain minor number of cases in which the relationship of the measles would be merely incidental. Some of the cited cases have the onset of the brain troubles as first occurring several weeks to a few months following the eruption. Naturally the

<sup>147</sup> *Journal of the American Medical Association*, June 19, 1920, p. 1697.

bearing of the measles infection to such sequelæ can be questioned with justice. Of course, bacteria of various kinds may be harbored for a long period and under certain conditions be released as a local or general infection, when resistance in the host has been lowered by a disease such as measles.

"2. The second group would include the secondary infections due to various organisms. The bacteria may be delivered to the central nervous system by the blood stream. However, the mode of invasion is undoubtedly in most instances through the cribriform plate from the nasopharyngeal cavities. This route of infection for *Diplococcus intracellularis meningitidis* and the acute poliomyelitis virus is now well recognized. A great many more cases of meningitis follow measles, compared with all the complicating disorders in the central nervous system. The fact that a large majority of the complications have their onset a few days following the disappearance of the eruption or during the early convalescence speaks for the importance of this second group. The interval is in accordance with the incubation period required for most of the organisms for secondary infections.

"3. The third small group is a less certain one, owing to the fact that the exact etiology for measles is as yet undetermined. Clinical studies of the disease lead us to believe that the blood stream is teeming with the virus. Accordingly, the vascular channels of the meninges and brain may readily become involved. Certainly, some of the brain complications first manifested during the eruptive stage or the early convalescent period may be caused directly by the unknown virus of measles. Even some of the troubles appearing later in the convalescence may be due to this cause."

CONVALESCENTS' SERUM IN MEASLES. An interesting suggestion has been made by Degkwitz.<sup>148</sup> In the children's clinic at Munich he injected 7 to 22 c.c. of serum from a convalescent patient into another child, either in the family or in ward patients. When such a child had been very definitely exposed to measles by being closely associated with a case of the disease, none of the children so injected developed the disease, although many who were not so treated did. The blood for the purpose was drawn from a vein in the arm, from seven to ten days after the temperature had reached normal, usually about 40 c.c. being taken, which gave a result of 16 to 18 c.c. of serum. A small amount of 5 per cent. solution of phenol was added and the serum kept in fused ampules until used.

This author also raises the question as to whether the serum of adults might not have the same action, inasmuch as almost all have passed through measles. He believes, however, that larger doses would probably be required. He also makes the suggestion that similar technic may be of service in preventing scarlet fever.

**Meningitis.** EARLY DIAGNOSTIC SIGN IN BASILAR MENINGITIS. Gingold<sup>149</sup> has described a sign which he calls reflex strabismus and which he believes to be of great value in making a diagnosis of basilar

<sup>148</sup> Zeitschrift für Kinderheilkunde, May, 1920, No. 1-3, p. 25.

<sup>149</sup> Archives of Pediatrics, January, 1920, p. 19.



meningitis, particularly in young infants in whom the yielding cranium keeps the intracranial pressure below the fatal limits, very often for weeks before definite signs appear.

By flexing the head on the chest, either a bilateral or a unilateral strabismus develops, which will last as long as the head is kept in a flexed position and disappears when the head is relaxed. In many cases the strabismus is accompanied by retraction of the upper eyelids and in some cases Gingold noted a contraction of the pupils. The reflex is present in the early stage, but in the late or paralytic period strabismus will not be produced. The effect on the pupils has been noted previously by various authors, a contraction being produced in flexing the head and a dilatation in extending it. Gingold believes that the strabismus is caused by suddenly increasing the pressure at the base of the brain by flexing the head, the pressure acting on the abducens with a consequent loss of power in the external rectus, or pressure on the ocular motor nerve with spasm of the internal rectus, which would also account for the retraction of the upper eyelids and the myosis.

THE TREATMENT OF MENINGITIS BY INTRASPINAL INJECTIONS OF THE PATIENT'S BLOOD SERUM. A therapeutic measure that has, perhaps, not been properly appreciated is the use of blood serum of the patient administered intraspinally, a method which may be found useful in a number of different conditions. The remarkable experience of Goodman and others in the treatment of acute chorea (see same) by this method is worthy of attention, and the treatment of meningitis, especially where there is no available antiserum, is another field in which it may be found of great value. In 1908, McKenzie and Martin reported 20 cases of cerebrospinal fever treated by serum from the patient or of serum from other patients convalescent from the disease. Of these, 4 were chronic cases and all died; of the 16 acute cases, 10 recovered, and, of these, 2 were treated by injections of their own serum.

Waterhouse<sup>150</sup> has reported an instance in a patient suffering from what was supposed to be cerebrospinal fever. The cerebrospinal fluid was not examined until the eighth day and the absence of meningococci so late in the disease would not invalidate the diagnosis. About 50 c.c. of blood were removed from a vein and 20 c.c. of the serum from this was slowly injected by lumbar puncture after removal of the same quantity of cerebrospinal fluid. This proceeding was repeated on three following days. Only 3 c.c. of fluid, however, were injected each day. A further 5 c.c. injection was given two days later. The patient made an uneventful recovery.

THE TREATMENT OF EPIDEMIC MENINGITIS. Lewkowicz<sup>151</sup> has a readable contribution on this subject in which he reaches the conclusion that the lateral ventricles are the principal and essential foci of infection acting as a sort of incubator where the meningococci grow in numbers and from which they extend to every part of the subarachnoid space. He believes, therefore, to obtain satisfactory results, it is necessary to inject the serum directly into the ventricle and he believes that the

<sup>150</sup> British Medical Journal, January 10, 1920, p. 45.

<sup>151</sup> Archives de Médecine des Enfants, vol. xxii, p. 617.

failure of serum given intraspinally is that the serum does not penetrate the ventricle in sufficient quantity or there may exist obstacles in the pathway of communication so that it may not reach the ventricle at all. He believes that the injection should be made into the lateral ventricle, beginning as soon as possible and giving injections daily on alternate sides or else giving the serum every other day on both sides. From 10 to 20 c.c. are administered at each dose. His procedure is to puncture the skull with a Götze grooved drill, 1.5 mm. wide, in a hand drill. The needle is introduced through the opening so made and he used one 1 mm. in diameter and 7 or 7.5 cm. long. A brass guide for the needle is introduced into the groove before the latter is drawn out. The guide inside the needle prevents destruction of tissue, and the needle is not sharp as the dura is the only tough tissue through which it has to pass. For infants the depth of the puncture is about 40 mm., 50 to 60 mm. for a child, and 60 to 75 mm. for adults. Great care should be taken not to inject the serum until it is certain that the needle is in the ventricle. The pressure is measured by a manometer attached with a three-way stop-cock between the needle and the syringe. The tension should not surpass 60 to 70 mm. for adults and older children and 40 to 50 mm. for infants. The needle is left in place for ten minutes after the injection is made to allow the tension to fall. It is then drawn out and left for fifteen or thirty minutes to allow for the plugging up of the punctured canal with a clot.

In his last series of 22 cases, the mortality was 36 per cent., but all the fatalities were explained on the basis of a defective antiserum or a fulminating course from the start. He believes that the best method is to inject both ventricles on the same day. Either the ordinary antimeningococcus horse serum may be used or the serum of convalescents, provided that there are sufficient antibodies to warrant its use. He believes that in connection with the serum one may use a vaccine to produce an immunity which, it seems, may take place in the course of an acute attack of the disease. He believes that immunization so produced contributes to the cure, particularly in the cases in which there is no tendency to spontaneous cure, especially in those of the very severe type.

**Mumps.** THE DUCT SIGN IN MUMPS. The diagnosis of mumps rarely presents any difficulty and yet there are times when the problem may be very perplexing, so that a new sign described by Cowie<sup>152</sup> is most welcome. He has studied 57 cases and it was present in 96 per cent., and was present in all cases of parotid mumps at some time during the disease. It has not been determined as yet whether the sign is pathognomic for mumps or whether it will be found in other acute inflammatory conditions. It certainly occurs in some of the inflammatory conditions involving the parotid and its duct. If, in a case of mumps, the mucous membrane of the cheek is well separated from the teeth, the orifice of Steno's duct on the affected side or sides will present a reddened spot measuring from 1 to 2 mm. in diameter. The duct will usually be found to project beyond the surface of the mucous membrane from 1 to 3 mm.

<sup>152</sup> American Journal of Diseases of Children, August, 1920, p. 75.

In other words, the duct becomes teatulated. The duct is edematous and is usually pale, as a whole, thus accentuating the red central spot which, at times, gives the appearance of a minute ring because of the central opening which may appear darker. In some cases the greater part of the teating is slightly injected. Minute hemorrhagic points may be seen scattered over an area surrounding the duct as great as 2 cm. in diameter. The orifice of the duct is tumefied and from it, at times, may be seen to exude a limpid fluid.

The involvement of the duct is a progressive and retrogressive change. The spot usually appears first and is followed by teatulation with retrogression in the reverse order.

*The Red Spot.* The redness varies in shade from a faint pink to a deep inflammatory red; in many cases it never progresses to the deep red stage. As the swelling of the parotid gland recedes, the spot becomes paler and finally disappears. The spot develops early in the disease and, in all probability, precedes in most cases the observable swelling of the parotid gland, as witnessed by the presence of the spot on the unaffected side before the parotid swelling on that side appears.

The opening of Steno's duct, normally, is more marked in some persons than in others. The slight increased depth of color in such individuals is definitely not inflammatory and is easily differentiated after the duct is once seen. In a series of sixty-eight normal persons, children and adults, the duct opening showed a faint but distinct pink color, differentiating it from the surrounding tissues in 14 per cent. of the cases.

*The Teatulation.* Under normal conditions, at times, Steno's duct projects beyond the buccal mucous membrane. The opening of the duct, however, is not inflamed and in mumps when such a duct is present, if it is watched closely, it will be seen to undergo a definite change throughout the course of the disease. Teatulation does not always occur. At a careful examination of the ducts in a series of sixty-eight normal persons, children and adults, one or both the ducts projected beyond the mucous membrane in 37 per cent.

*The Duct Pallor.* The duct is usually pale, the pallor so well known in the ordinary mucous membrane swelling of the mouth. At times this pallor gives the impression of a pale bluish areola surrounding the central red spot.

*Duct Congestion or Injection.* In this case distinct hemorrhages were seen and seemed to be a part of the progressive change. Small hemorrhagic spots on the buccal mucous membrane are not uncommonly seen in children from traumatism—biting the cheeks—and it is possible that this patient may have bitten the projecting mucous membrane. The duct on this side projected fully 3 mm. and the ducts on both sides could be seen to run in between the upper teeth when the cheeks lay against them."

ORCHITIS IN MUMPS. As far back as the days of Hippocrates orchitis has been described as a complication of mumps, and anyone interested will do well to read this first description. Pratalongo describes it as a frequent complication in 1752 in an epidemic that occurred at Geneva,



and Hamilton, in 1761, in his classical contribution lays considerable stress on it and gave an account of the subsequent atrophy. In more recent years a great deal of attention has been paid to this subject and more or less complete reviews have been made by Laveran in 1879, by Comby in 1893, by Schotmüller in 1904. Since that time until the present there have been no special attempts to bring the subject up to date, so that the contribution by Wesselhoft<sup>153</sup> is of particular interest. That the virus of mumps should attack the tissue of the testicle is perhaps not remarkable, considering the close relationship between the salivary glands and the generative organs. There are numerous facts known on this subject concerning the lower animals in normal conditions and affecting man under abnormal conditions. As, for example, the simultaneous swelling of the parotid with the menstrual flow, the enlargement of the parotid with pregnancy and the parotitis following operative procedures. Just why orchitis should develop in mumps, of course, is not definitely known, but it may be assumed that metastasis takes place through the circulation, inasmuch as changes occur in the ovary as well as in the testicle, although this manifestation of mumps has been pretty generally overlooked.

Some observers have thought that the virus was transferred by the hands, going through the urethra into the testicle, but this can hardly be the case. Dukes believed that the orchitis was induced, at least to a certain extent, by exercise during the acute stage of the disease and he believed that if the patients were kept in bed for eight days that orchitis would not develop. This, of course, was an error in observation as it is well known that this complication may occur in individuals who have been strictly confined to bed.

As a rule, orchitis in mumps is confined to the age of puberty or adolescence, but Steiner has reported an instance in a nursing infant nine months old, and there have been a number of occurrences reported in young children.

The incidence of the complication varies considerably. In some epidemics the incidence is quite low, sometimes amounting to less than 1 per cent. In many epidemics the number does not exceed 5 per cent., while, on the other hand, it occasionally runs as high as 50 per cent. Wesselhoft collected, from a series of 8053 cases, 1468 cases of orchitis, or 18 per cent. The gland may be affected on one or both sides, but bilateral orchitis is considerably less frequent than bilateral parotitis. Where only one gland is affected, it is more apt to be the right than the left, although this does not seem to be a matter of any importance and no especial reason has been given for it. The more severe the disease, the more likely the early occurrence of orchitis, while the development of this complication in the disease seems to bear little or no relation to the severity of the original attack. Wesselhoft states that, in his experience, when the orchitis comes on within three or four days of the onset of the parotid swelling, the orchitis usually accompanies a bilateral parotitis, but when it is delayed one or two weeks, the preceding parotitis

<sup>153</sup> Boston Medical and Surgical Journal, October 7, 14, 21 and 28, 1920, pp. 421, 458, 491 and 520.

is just as apt to have been unilateral as bilateral. There are instances in which the orchitis preceded the swelling of the parotids, and Feiling reports a case of double epididymitis preceding double orchitis which was followed in four to six days, respectively, from the onset in the two testes by the involvement of the submaxillary glands, the parotids remaining unaffected. Wesselhoeft has collected from the literature 64 cases in which, during epidemics of mumps, orchitis occurred without any apparent preceding or subsequent involvement of the parotid or submaxillary glands, and where all possibility of venereal disease or trauma could be excluded. In these, the course of the disease was comparatively mild.

Orchitis in the majority of cases appears from three to seven days after the height of the swelling of the parotids, but the onset of it may be delayed into the third week after the onset of the parotitis. Not infrequently there is a chill, rise of temperature, headache and pronounced weakness, and very often nausea, vomiting, diarrhea and sometimes delirium. In bilateral orchitis the second gland usually follows the first in from three to nine days, generally from the sixth to eighth day after the first. When both glands become affected at the same time, which is rare, the constitutional symptoms are usually markedly increased. The swelling begins to go down between the third and sixth day after the onset, and disappears after the end of five days. The changes taking place in the gland consist of a serous exudate in the septa and lobules which spreads to the tunica vaginalis and, in some, to the skin of the scrotum, giving rise to definite redness or swelling. There may or may not be an acute epididymitis and sometimes an acute hydrocele may be developed. From four weeks to six months after the swelling there may be a diminution in the size of the gland and also a change in the consistency, roughly described as increased compressibility. This is the result of necrosis occurring in the acute stage and the amount of atrophy depends upon the amount of destruction. In some instances the testicle undergoes complete atrophy, with a subsequent fibrosis and a partial and complete destruction of the seminiferous tubules.

When one gland is affected there may be no general changes, but where both glands are atrophied, there may be a tendency to the condition described as feminism. In some instances the individual may be rendered sterile. Constitutional changes, as regards the conformation of the body, may be wanting, even though both glands are very much atrophied, and in some instances the changes may be only temporary. There may or may not be marked changes in the sexual desire. In some cases where both glands are atrophied, there may be complete absence.

The prophylaxis of orchitis in mumps is as yet an unsolved problem, according to Wesselhoeft. As mentioned before, Dukes suggested keeping the patient in bed for eight days, but in 1900 he retracted this assertion because in a series of 30 cases he had orchitis in 20 per cent. in spite of the fact that all the patients were strictly confined to bed. Radin<sup>154</sup> noted that patients who were allowed to go about to meals and

<sup>154</sup> Archives of Internal Medicine, September, 1918, ii, 365.

walk about the wards showed no greater incidence to the complication than those who remained in bed. The use of convalescent mumps serum may possibly have some value in preventing orchitis, but we have no definite information on this subject. Hess<sup>155</sup> used such a serum from convalescent cases in 20 children who were exposed to the disease during an epidemic in an asylum and none of these children so treated developed the disease; and Gradwohl, and his associates,<sup>156</sup> used 5 c.c. of convalescent mumps serum in severe cases. They thought they obtained some alleviation of the acute symptoms, but whether this had any effect on the development of orchitis or not is not known.

The *treatment of the orchitis* consists of either the application of cold or, in some instances, of heat with the idea of allaying the pain, and all sorts of local applications have been used, probably with little or no effect. Wesselhoeft does not believe that any of the local applications have any effect and does not see any indication for the routine purging advocated since the days of Hippocrates and Galen, or for any other form of internal medication. Wesselhoeft believes that if local applications of heat or cold do not control the symptoms promptly, surgical interference should be resorted to, and he recommends an incision through the tunica vaginalis and multiple incisions through the tunica albuginea to relieve the pressure by escape of the fluid and to stop the pain, and he believes that this measure not only gives relief from the suffering, but may preserve the epithelial and interstitial cells from degeneration. The operative treatment of orchitis and epididymitis of gonorrheal origin has been in vogue for over a generation. Smith, following the suggestion of Hugh Cabot, operated on two cases of orchitis due to mumps with very satisfactory immediate results, and Abraham and others have also made reports on this subject. The ultimate results of it will necessarily await the passage of time.

The *prognosis in orchitis*, Wesselhoeft regards as a serious matter, inasmuch as there is appreciable atrophy in 55 per cent. of all cases of orchitis which occur in 18 per cent. of mumps. The degree of impairment, however, cannot be figured by the degree of atrophy, as the procreative power will not be interfered with so long as there is sufficient healthy gland substance left to functionate. Wesselhoeft was able to find two cases of sterility in the male from a careful study of the literature of orchitis, and states that he nowhere found any mention of a eunuch as the result of mumps.

**Plague.** DIAGNOSIS OF HUMAN PLAGUE. This is a disease which may be found among us at almost any time and one upon which comparatively little appears in the text-books, so that an article by Williams<sup>157</sup> may be commented upon. A more extended description for those especially interested will be found in the work of Stitt.<sup>158</sup>

There are four different forms of plague and in their order of frequency and importance to the American physician may be listed as bubonic,

<sup>155</sup> American Journal of Diseases of Children, 1915, x, 99.

<sup>156</sup> United States Navy Medical Bulletin, Washington, October, 1919, p. 736.

<sup>157</sup> Journal of the American Medical Association, August 7, 1920, p. 370.

<sup>158</sup> Diagnosis and Treatment of Tropical Diseases, 3d edition, 1919.



pestis minor, septicemic and pneumonic. The bubonic is by far the most common, and the form which is most likely to occur in this country, although the other forms may be met with and there has been recently a small outbreak of bubonic plague in one of the western states.

Bubonic plague is marked by the appearance of a bubo, accompanied with a rise of temperature and marked prostration, with a history of a sudden onset. There is frequently a mental haziness and some disturbance of motor coördination suggesting certain stages of alcoholic intoxication. Chill is quite common and the temperature varies from  $100^{\circ}$  to  $106^{\circ}$ , with  $102^{\circ}$  as an average. Prostration is very marked, and by the end of the fourth or fifth day of the disease the patient is usually semi-conscious and quite limp. There is a rapid, compressible pulse, flushed skin and injected conjunctivæ. The bubo is, in 90 per cent. of the cases, femoral and practically always only on one side. The main mass is usually below Poupart's ligament or a swelling not infrequently appears above it. There are four characteristics of the bubo. It appears at the onset of the disease, the swelling is caused by infiltration of the tissues, as much as, if not more than, by swelling of the lymph nodes. The skin is hot and red and the mass exceedingly tender and painful to the touch. It does not suppurate until a week or two after the onset, if at all. Seen early, the individual lymph nodes can be made out, but later there is only a large hard swelling. It differs from the venereal bubo in being broad and flat and rarely comes to a point.

Pestis minor is lacking in the sudden onset and prostration. There is general malaise, with fever for two or three days and a slowly developing bubo.

In septicemic plague there is a blood infection, with death in three or four days. These cases are not liable to occur except in connection with small or large epidemics of plague and one merely sees an individual who has been taken very ill suddenly and who dies without any special diagnosis being made. At autopsy, the smears from the liver and spleen, and guinea-pig inoculations would serve to make the cause of the disease clear.

Pneumonic plague is relatively rare, but is directly contagious and so when it does appear is apt to come on in disastrous epidemics. It is essentially a disease of severely cold weather. There are three points of difference from other forms of pneumonia. There is a sudden onset and the patient is extremely prostrated, with almost no chest signs. The patient dies by the time involvement of the lungs can be demonstrated. The sputum is watery and never thick and tenacious, and very soon becomes bloody. The bacilli can be found in the sputum in large number. Diagnosis of plague rests on laboratory methods.

In the bubonic and pestis minor the organism is obtained by inserting an eighteen- or twenty-gauge needle into the bubo and into the lymph node, if possible. A drop of fluid can be aspirated. Smears are made and then 1 to 2 c.c. of salt solution or plain water are drawn into the syringe and, after thorough shaking, portions of this are injected subcutaneously or intraperitoneally into two guinea-pigs. In 90 per cent. of the cases the characteristic bipolar bacillus can be demonstrated in

the smears, and in 99 per cent. of the cases one or both guinea-pigs will die within ten days with characteristic changes, of injection, bubo, large liver, and large, granular spleen, with the bacilli present in large numbers. When the injection is made intraperitoneally the pig dies earlier, without the bubo or markedly granular spleen.

When the septicemic form is suspected, 3 or 4 c.c. of blood are drawn from the vein, thick smears made and the guinea-pigs inoculated.

In pneumonic plague the examination of the sputum and the inoculation of guinea-pigs with it are recommended. In the sputum the plague bacillus can only be correctly diagnosed by experienced observers. Smears should be made reasonably thin, dried in the air, passed through a flame and then stained with carbolthionin, carbolfuchsin or Loeffler's methylene blue, the first named dye giving the best staining. The organism is short, thick, with rounded ends and is usually present in large numbers. Diagnosis can never be made on a few organisms. The bacilli stain lightly and a considerable number show up by polar staining, shading down to the central part which is almost completely clear. In smears from human bubos the organisms may be found inside the white cells.

**IMMUNIZATION AGAINST PLAGUE.** In the Dutch East Indies there is an active health service that for the past few years has published quite a number of very valuable contributions dealing with the infectious diseases as they are found in Java, Sumatra and the neighboring regions. Among the recent contributions is one dealing with the question of immunization against plague by P. C. Flu.<sup>159</sup> His studies deal with watery extracts which he gives the name aggressines. The literature on the subject of vaccination against plague is not particularly large, but is quite contradictory. Among the first to attempt vaccination on a large scale was Haffkine. He demonstrated to his own satisfaction that using a six weeks' old broth culture of the plague bacillus, killed by heating at 65° C., he could confer an effective and lasting immunity against plague. His results could not be obtained by other observers, and it was shown that while his vaccine did protect, the immunity was not absolute and probably did not last much longer than six months. Notwithstanding the fact that Haffkine's conclusions were not found to be exactly as he stated them, he is still to be regarded as one of the great figures in the conquest of infectious diseases. A pioneer not only in plague vaccine, but in work in cholera, as noted elsewhere in this review.

Flu reviews at some length the work of the other investigators and then details his own observations. He does not believe that conclusions can be drawn from observations on human beings on account of the many factors which enter into the problem and suggests that observations on animals carefully controlled would give very much better results. Of course, in the end, the final proof is whether the vaccine is actually effective in preventing the disease.

He made a large number of observations on various animals subject to the disease, using pure aqueous aggressines, aqueous extracts from

<sup>159</sup> Mededeelingen van den Burgerlijken Geneeskundigen Dienst in Nederlandsch-Indië, 1919, viii, 18.

the *Bacillus pestis*, mixed with the bodies of the extracted bacilli; aqueous extracts from the *Bacillus pestis* mixed with 33 per cent. pure glycerin. He found that the only one for which he claimed any immunizing power was the aqueous aggressines and he believes that this method of vaccination will stand comparison with the best yielded up to the present time with other methods.

The future of the plague vaccination would seem to be comparatively bright, as systematic work will undoubtedly be found to solve the problem.

Anent immunization against plague, there is a letter from Beals,<sup>160</sup> from India. He states that for the past twelve years they have been inoculating individuals living in infected areas with Haffkine's vaccine. He believes that the vaccine is of the greatest value and that the natives are beginning to realize it, so that in place of having to be urged to submit to inoculation they come voluntarily and in ever-increasing numbers. In Wai, in 1916 and 1917, among less than 6000 uninoculated persons, there were 275 attacks of plague and 167 deaths, while among 4378 inoculated there were only 39 attacks and 10 deaths. For the same region in the following year there were less than 6000 uninoculated with 76 attacks and 47 deaths, while among 4831 inoculated there were 17 attacks and 2 deaths.

McCoy and Chapin<sup>161</sup> have made a brief report on the utility of anti-plague vaccines and serums. They state that they are not acquainted with any evidence indicating that any vaccine has ever controlled an epidemic of plague which, of course, is all the more reason for continuing experimental investigations. On the therapeutic side, various serums have been made. As early as 1897, Yersin made a serum by immunizing horses with it and later with living cultures, and this method was subsequently modified by Lustig and Galeotti, who used as an antigen a substance obtained from a plague bacilli by a special process, and Rowland subsequently made a serum which had definite protective and curative properties when used in infected rats.

As far as the use of the serum for prophylactic purposes is concerned, in its present form it does not seem to be satisfactory as whatever protection is conferred does not extend beyond ten days. As regards the therapeutic use of this serum the mortality does not seem to have been lowered and yet in carefully controlled series of cases there has usually, although not always, been some advantage on the side of the serum treated cases. One example of very satisfactory results is that obtained by Seeman, who used it in an epidemic occurring at New Orleans in 1914. He gave very large doses, as much as 200 c.c. at a time and these were repeated. A great deal evidently depends on the quality of the serum and on giving sufficient of it.

There is a very practical lesson to be learned in considering plague prophylaxis, and that is in view of the fact of the somewhat doubtful character of the methods in use at present it would seem of the very greatest importance to carry out the only method that offers a hope of

<sup>160</sup> Journal of the American Medical Association, October 2, 1920, p. 955.

<sup>161</sup> Public Health Reports, July 9, 1920, p. 1647.



freedom from the disease, and that is to kill off the rodents, a point upon which I have commented numerous times, and this is one feature which ought to make its appeal quite apart from its hygienic side and that is the enormous saving in property of various kinds. The bill paid by the Americans for damage done by rats runs into almost unbelievable figures.

Let no one imagine that the warning given above with the suggestion of preventing plague is not needed in this country. More than once the individuals giving suggestions and advice on the prevention of disease have been likened to Clytemnestra, to whom the gods gave the gift of prophecy, but the curse that nobody would believe her. The *Public Health Reports* (October 1, 1920, p. 2356) show that from October 22 to December 31, 1919, there were 12 cases and 4 deaths in New Orleans. From May 1 to August 31, 1920, there were 10 cases and 4 deaths in Pensacola. Beaumont, from June 19 to August 20, had 14 cases and 5 deaths; and Galveston from June 8 to September 7, had 11 cases and 8 deaths.

Slowly, but apparently surely, plague is finding a foothold on this continent, as evidenced by the number of rodents found plague infected: 31 at Pensacola; 276 in New Orleans in 1919, and 285 in 1920, and also large numbers at Beaumont and Galveston. The lesson is obvious. It only remains to be seen whether we have intelligence enough to grasp its significance and it does not require very much to do that.

**Glucose as an Adjunct Measure in Pneumonia.** The administration of glucose has been suggested in a number of different conditions, and John<sup>162</sup> reports upon the results obtained in pneumonia. As a routine he used a 10 per cent. solution, but in some instances a 30 per cent. solution was used. He usually gave two doses daily, giving 250 c.c., which figure about 100 calories. He found that, following the administration, the patient was more comfortable and would fall asleep and have a good rest, followed by perspiration and a drop in temperature of from one to three degrees. It slowed the heart and increased the volume of the pulse and increased the elimination through skin and kidneys. In addition to the rest, he believes that it adds additional volume of liquid, that it combats acidosis and strengthens the heart muscles directly by supplying carbohydrate to the tissues. Chills sometimes follow the administration of glucose and Mosenthal believes that commercial glucose is preferable to the chemically pure product which, in its purification, contains traces of acetic acid and he is of the opinion that these traces of acid may have something to do with the chills that follow.

**Poliomyelitis in 1920.** There has been a small epidemic of poliomyelitis in and about Boston, totaling, up to October 16, some 212 cases. The epidemic began July 24 with one case, and during the period of the epidemic there were 496 cases in Massachusetts. The curve representing the incidence of the disease corresponded to that of the epidemic of 1916, the peak of the epidemic being reached October 2. In New York City, from January through October, there were 119 cases for 1920, against 31 in 1919.

<sup>162</sup> American Journal of the Medical Sciences, October, 1920, p. 542.

The point of interest in this epidemic is the fact that there has been no excitement. This was quite remarkable considering the attitude of the public mind toward infantile paralysis. There are two reasons for this: One is that with one exception the public press made no comment on the situation. The second is that the regulations of the health department were extremely lenient. In 1916, the patients were all sent to hospitals. In 1920, they were allowed to stay in their own homes under regulations very similar to those used in scarlet fever and diphtheria. The lesson in this is obvious, but I do not believe that it will make the proper impression on the health authorities and the public press of the country in general, so that we may confidently look for a repetition of the hysterical state of mind, that was experienced in 1916, the very next time a small epidemic occurs where the press and the public health officials are not as well poised as they seemed to have been in Boston during the past summer.

A good many years ago there was a cartoon that was widely copied. It represented Cholera going to Egypt disguised as Death, and the following dialogue ensued between Death and the Interlocutor: "Where are you going, Cholera?" "I am going to Egypt to kill five thousand." A second picture showed Cholera leaving with a toll of some fifty thousand deaths. "Ah, Cholera, you have killed fifty thousand, where you said you would kill but five thousand!" "You are wrong," said Cholera, "I killed five thousand; fear killed the rest."

**NASAL INFECTION IN POLIOMYELITIS.** It is pretty generally believed that the virus of poliomyelitis enters the central nervous system by way of the nasal passages, and it has been shown that the virus may be present in the nose without inducing any signs of the disease. There is a very wide diversity of opinion regarding the carriers of the virus as to how long the carrier stage persists. Certain observers, such as Wickman, and Kling, Pettersson and Wernstedt, believe that both healthy and chronic carriers are very numerous during epidemics of the disease and possibly greatly exceed the number of actual cases, and also that the virus persists for some time, although it is supposed to undergo gradual deterioration. Opposite views are held by other observers, notably Flexner and Amoss, who were not able to demonstrate either the great frequency of the virus in the nasal mucosa or the tonsillar tissue, or the long survival in convalescence. While the virus could be demonstrated in the tonsillar and other tissues during the early period of the disease in man, they observed no effects, as a rule, from inoculation of the tissues taken after the acute symptoms had subsided.

These same observers<sup>163</sup> have brought forward a series of observations of very considerable interest. They demonstrated that certain monkeys are highly refractory to inoculation by applying the virus to the nasal mucosa and this is apparently due to the fact that the nasal mucous membrane possesses ability to destroy or otherwise render ineffective the virus applied to it and this property of the nasal mucosa seems to be distinct from any specific protective substance active upon the virus

<sup>163</sup> Journal of Experimental Medicine, February 1, 1920, p. 123.

which may occur in the blood. If the nasal mucous membrane is thoroughly effective, it prevents the passage of the virus to the brain and spinal cord. When applied in the nose the virus will survive for an undetermined period of time upon a membrane that is ineffective in preventing the passage, but only for a relatively brief time upon a membrane that is effective for preventing the passage of the virus. This protective power is not in itself sufficient to prevent infection with the virus introduced upon it, inasmuch as slight injury to such independent structures as the meningeal choroid plexus favors the passage of the virus from the nose to the central nervous organs.

It seems hardly possible to overemphasize that the normal nasal mucosa has a defence against infection with the virus of poliomyelitis and a point of very great importance that Flexner and Amoss have brought forward is that the application of antiseptic chemicals does not seem to exert any great protective action and is of very doubtful value indeed, and is not only of doubtful value, but may do actual harm by lowering or destroying the power of the normal nasal mucosa to deal effectively with the poliomyelitic virus. As I commented in the review of this subject last year, the practice of using antiseptics in the nose during an epidemic of poliomyelitis as a means of preventing the spread of the disease, certainly with our present view of the transmission of poliomyelitis, is therefore to be condemned.

Of great practical importance are certain observations undertaken with the view of blocking infection and preventing extension to the central nervous system. It seems that injection of antipoliomyelitis serum into the blood is effective. The point at which the blocking takes place is in doubt, although the observers quoted believe it probably takes place in the subarachnoid space.

A great deal more work will have to be done along this line before we are in possession of sufficient data to enable us to apply it to human beings. It would be of great interest to have an account of experiments made with a view of producing active immunity by use of some form of vaccine. I believe it is highly probable that the eventual solution of the problem of the prevention of poliomyelitis will be worked out along these lines.

THE INFLUENCE OF POLIOMYELITIS ON OTHER CONTAGIOUS DISEASES. An article dealing with the influence of epidemic poliomyelitis upon the susceptibility to, and the symptomatology of, other contagious disease has been contributed by Regan.<sup>164</sup> His observations were made during the epidemic of 1916 on a large number of cases admitted to the Kingston Avenue Hospital in Brooklyn. Owing to the large number of patients who were admitted daily, it was impossible to scrutinize them with a view to preventing the entrance of children with other infectious diseases. Small outbreaks of mixed infections were a common experience in the treatment of contagious diseases, especially in hospitals with open wards these outbreaks originating from the disease being brought in from the outside, usually by a patient in the incubation period. In the Kingston

<sup>164</sup> Archives of Pediatrics, May, 1920, p. 257.



Avenue Hospital week after week passed without any serious outbreak of mixed infection and the poliomyelitis service remained virtually free from other contagious diseases with the exception of whooping-cough and this freedom lasted throughout the epidemic. Out of 1798 patients admitted, patients with poliomyelitis developed the following diseases: Pertussis, 9 cases; diphtheria, 3 cases; measles, scarlet fever and varicella, each one. The percentage of mixed infection was, therefore, 0.83 per cent., and if pertussis be excluded from the series, it was 0.33 per cent.

The child with measles was admitted in the incubation period and developed symptoms ten days later. The rash had made its appearance before the disease was recognized. This child was in an open ward with thirty-two other children, all of susceptible age, not more than 20 per cent. of them protected by a previous attack, and in spite of this no other cases developed. In view of previous experiences with other contagious diseases, this freedom from the disease was regarded as remarkable. The patient with scarlet fever was in a ward with 30 young children, very few of whom had had a previous attack of the disease and there were no secondary cases. The 3 cases of diphtheria originated in different wards and there were no secondary cases, although the children exposed were those of the most susceptible age. There were no secondary cases following exposure to the one case of chicken-pox.

The only disease which prevailed at all was whooping-cough and patients in several different wards developed symptoms of the disease and several secondary cases developed, making a total of nine in all. Another curious fact was that ordinarily mixed infections are met with in cases admitted. During the epidemic there were very few such. Out of the 1798 cases there were poliomyelitis and pertussis in 14; poliomyelitis and measles in 2; poliomyelitis and mumps in one.

Regan suggests that this is due to either one of two suppositions: First, that children with acute poliomyelitis are not prone to other diseases with the exception of whooping-cough; and second, that children with other diseases are not prone to develop poliomyelitis. There are, as is generally known, certain curious antagonisms existing between various diseases and between certain species of bacteria. I have commented on this subject at various times, for example, the effect of vaccination upon whooping-cough and the antagonism between staphylococcus infections of the mouth and throat and diphtheria. The comparative immunity to other diseases in poliomyelitis may be due to some antagonistic action of the organism, or it may be due to the fact that it often happens that when one species of germ is grown upon medium this becomes less suitable for the growth of other organisms. As is well known, and as I commented on rather freely in *PROGRESSIVE MEDICINE* last year, when one produces an immunity to one disease there is a certain amount of immunity produced for certain other infections. In the early days the belief was in the specificity of infections and the immunity reactions, but observation and experiment have shown that this is probably not the case. Anyone interested will find a discussion of this subject in Park and Williams' text-book of bacteriology,

and in *PROGRESSIVE MEDICINE*, March, 1920, p. 123. Bearing directly on this point is the comparative absence of other infections noted during the influenza epidemic, as reported by the New York Health Authorities in May, 1919. Regan also quotes Welch and Schamberg, to the effect that the presence of an acute disease is apt to temporarily diminish the susceptibility of the patient to most of the exanthem maladies, and also that the susceptibility to measles may be almost temporarily abolished during the incidence of another acute infection. It is a common experience to note the changes in the course of whooping-cough when some other disease supervenes.

With the coincidence of poliomyelitis the disease is apparently made more mild in character. Regan found the association of poliomyelitis and pertussis in 23 patients, all of whom recovered. Whooping was present in 19 and vomiting in 17, and in several patients with paralysis of the muscles of the larynx the character of the paroxysmal cough was distinctly altered and not nearly so loud as usual, and the crowing sound of the cough was often so indistinct that unless one was within a few feet of the patient it was missed entirely.

With diphtheria there were 3 cases, all of whom recovered, the symptomatology apparently being uninfluenced. The one scarlet fever patient pursued a mild course and the patient recovered. In the 3 cases of measles, 2 recovered and 1 died, there apparently being no effect on the symptoms and the same was true of one case each of chicken-pox and mumps.

Regan suggests that it may be that the causative factor of poliomyelitis is so abundantly present in the nose, throat and upper respiratory tract that the infective agents of other acute contagious diseases find it difficult to obtain a foothold where they can develop to a sufficient extent to invade the body. An exception must be made in the case of the bacillus of whooping-cough in which the antagonism is not noted.

One other observation is of extreme interest: that is, the remarkably low mortality rate of these mixed infections, 3 per cent., compared to 23.9 per cent. in the straight poliomyelitis cases. Regan's article is an important contribution to the rather neglected subject of symbiosis and antagonism in infectious diseases.

**PARALYSIS OF THE NECK MUSCLES.** Figueira<sup>165</sup> has described a syndrome which presents several points of interest. He discusses this at length and questions whether or not it is a manifestation of poliomyelitis. He studied 11 cases in Rio de Janeiro. They all presented a paralysis of the muscles of the neck, noted in most instances when the child awakes, after the manner of the classic cases of poliomyelitis described by Kennedy in 1841. In one instance the paralysis manifested itself while the child was awake. In four-fifths of the cases there was more or less evidence of a general infection. There had been fever or catarrh of the air passages, vomiting, diarrhea or constipation. There was an absence of sweats or rigidity of the neck, or large mononuclear cells in the cerebrospinal fluid. The paralysis was recovered from in four or five days, in most instances the return to normal being complete. At the

<sup>165</sup> Archives de Médecine des Enfants, September, 1920, p. 513.

same time these cases were observed there were a certain number of cases of poliomyelitis in Rio. The blood did not show any significant changes, so that the whole question of the nature of the disease will depend on further study should there be a continuance of it.

**Rat-bite Fever.** A disease which the Japanese call *sodoku* or rat-bite fever, and which they have studied with perhaps more thoroughness than any other people is one which has to be reckoned with in considering the fevers which occur in this country. As early as 1840, Wilcox, in the *American Journal of the Medical Sciences*, reported an attack following the bite of a rat, describing the initial symptoms and the relapse which occurred three or four days after the subsidence of the first. One of the most recent reports is by Arkin.<sup>166</sup> On March 25, 1919, the patient, who was a boy, nine years of age, was bitten on the right index finger by a large gray rat. When he reached home it was painted with tincture of iodine. On the fourteenth day he began to complain of pain in the finger and a burning sensation, and the finger was reddened and swollen. There was enlargement of the lymph nodes in the right axillæ and the supratrochlear glands were slightly enlarged. The wound was incised and swabbed with iodine. Three days later, seventeen days after the bite, the boy complained of not feeling well. There were fever and chills and gastric disturbances. This attack was followed by three others in a period of seven days, each characterized by chills, fever, nausea, headache and pains in the extremities. The blood showed a leukocytosis during the febrile attacks, but returned to normal between the paroxysms.

This disease is one which is not as well known as it should be, so that a brief description of it may not be out of place at this time. It has been reported from Japan, France, England, India, Italy, Morocco, China, Spain, Germany, Brazil, Australia and the Philippines, as well as from the United States. The disease seems particularly prevalent in Japan, but whether the spirochete is more prevalent in rats in that country is not definitely known. According to Japanese investigators, the organism is found in from 3 to 12 per cent. of the rats of that country. The disease has been found in persons of various ages and in both sexes. It is more common in those whose occupation renders them more liable to be bitten by rats, that is, farmers, seamen and soldiers in the trenches and, of course, many people are bitten by rats who never develop the disease. If the wound is on the exposed part of the body infection is more likely and it may occur from a mere scratch.

Various organisms have been found in connection with this disease, but the spirochete *morsus muris*, described by Futaki and his associates, Ishiware and his associates, Ido and his associates and other observers, is generally believed to be the organism causing the disease. In previous numbers of *PROGRESSIVE MEDICINE* I have given a description of the observations of these various authors.

Ordinarily the rat bite heals promptly, but sometimes there is necrosis of the skin and some sloughing and, of course, there may be pus due to the secondary infection. The incubation period varies from five to

<sup>166</sup> Archives of Internal Medicine, January 15, 1920, p. 94.



thirty days with an average of twelve. There are some instances in which the incubation is either shorter or longer than the limits given. In cases coming on after bites on the face or head, the incubation is usually short and the disease severe and prolonged. Usually within two weeks after the bite the patient complains of pain and heat in the bitten area, which is swollen, bluish red in color and with some induration. Around the area of acute hyperemia there may be a slight edema giving a ring-like appearance about the central bluish-red induration. Reddish streaks appear in the direction of the local lymph glands which become enlarged and tender. The patient complains of headache, and backache, pains in the muscles and extreme malaise and then fever begins.

There is usually a sudden rise of temperature from  $102^{\circ}$  to  $105^{\circ}$ , starting with a chill, severe headache, pains in the extremities. There is often great thirst, nausea and vomiting and a feeling of anxiety. In severe cases there may be some mental disturbance, sometimes delirium or coma. This is most liable to be the case in the worst cases which die in the first paroxysm of fever. After from three to six days the fever falls with a sweat, and after an interval of two to six days without any fever, another attack occurs. In the cases which recover, the attacks become less marked and less frequent until in a few months they no longer recur, the average duration being two months. In the fatal cases the attacks become more severe until death results. Some of the Japanese observers report recurrences many years after the first attacks. Whether these are subsequent infections or not is not clear, although there is no history of any subsequent injury.

Classified according to the form of fever, we have the following:

1. Febrile form with exanthem:
  - (a) Intermittent fever.
  - (b) Continuous fever.
2. Febrile form with nervous symptoms:
  - (a) Acute.
  - (b) Subacute.
3. Afebrile form with marked nervous symptoms.
4. Abortive form.

Very marked symptoms of involvement of the nervous system may occur, including very marked weakness of the muscles, most marked in the legs. In some cases, but not all, there is an exanthem which appears as a macular eruption in spots varying in size from 5 mm. to 10 cm. The color is red, or bluish red, and may be noted on the skin about the bite, also all over the body. Toward the end of the disease there may be an acute urticaria.

Arkin gives the following points of value in the diagnosis of the disease:

1. History of bite by rat or other animal.
2. Cardinal symptoms, of which one or more are usually present:
  - (a) Characteristic fever, usually relapsing.
  - (b) Exanthem.
  - (c) Muscular pains.
  - (d) Nervous symptoms.
  - (e) Lymphangitis and adenitis.

3. Demonstration of *Spirocheta morsus muris*.

(a) In blood during febrile attack.

(b) In area of bite, skin lesions or enlarged lymph glands.

(c) Animal inoculation, preferably mouse in which spirochetes can be demonstrated in blood in from five to fourteen days, or guinea-pig, etc.

## 4. Therapeutic test: administration of arsphenamin.

In the differential diagnosis we must consider: (1) Erysipelas; (2) pyogenic infection (phlegmon or pyemia or septicemia); (3) relapsing fever; (4) trench fever; (5) malaria; (6) syphilis; (7) erythema multiforme.

1. *Erysipelas*. This disease can be differentiated by finding the streptococcus; absence of characteristic exanthem of rat-bite fever; temperature curve; course of the disease.

2. *Pyogenic Infection*. In rat-bite fever blood culture is negative; absence of suppuration in the bite, unless secondary infection occurs; characteristic fever; incubation period; eruption; history of bite.

3. *Relapsing Fever*. Finding of spirochete of Obermeyer; number of attacks rarely more than three; short incubation period.

4. *Trench Fever*. Spread by body louse; fever, relapsing or irregular, or continuous; sudden onset like influenza; nystagmus on extreme lateral rotation of eyeballs; enlarged spleen, harder than that in typhoid; macular rash; shin pains; painful joints without swelling; no laboratory diagnosis at present. Caused by resistant filtrable virus.

5. *Malaria*. Blood examination (*Plasmodium malariae*); therapeutic test by use of quinin; enlarged spleen; endemic character of disease.

6. *Syphilis*. History of infection; examination of lesion for *Spirocheta pallida*; Wassermann test; clinical manifestations.

7. *Erythema*. Symmetrical arrangements of lesions; absence of history of external injury; recurrence of lesions; lesions of vivid color; often edematous, frequent association with rheumatism.

The prognosis is fairly good as the mortality is generally about 10 per cent. The treatment consists in prophylaxis by cauterizing the bitten area with fuming nitric acid, an incision being done if necessary. It is said if this is done within an hour after the wound is inflicted the disease may be prevented. Hata, in 1912, reported the use of arsphenamin in 8 cases with complete recovery and disappearance of symptoms in all but one case. This form of therapy has been found to be efficacious in the disease as it is produced in animals and can be recommended in human beings. Treatment by mercurials has also been found to be effective.

This disease should always be borne in mind in recurring fevers and is another argument, were any needed, for a thorough rat-proofing of modern dwellings and extermination of the rat.

**The Hemolytic Streptococcus of Scarlet Fever.** There has been an enormous amount of work done on scarlet fever with reference to its etiology and particularly to the relation of streptococci found in the throat to the disease. Tunncliffe<sup>167</sup> has made some studies regarding

the specific nature of this hemolytic streptococcus and found that the serum of sheep immunized with streptococci from the throat in the acute stage of scarlet fever contains opsonins and agglutinins for the hemolytic streptococci that appear in the throat and complicating lesions early in the disease, but not for the hemolytic streptococci from other sources, such as erysipelas, mastoiditis, measles, influenza, diphtheria and the normal throat. She also made a series of absorption tests which would also seem to indicate that the hemolytic streptococcus from scarlet fever forms a distinct group, scarlatinal streptococci removing the opsonins and agglutinins from this group, while absorption with a hemolytic streptococcus had no such effect.

**Half a Century of Smallpox and Vaccination.** The Milroy Lectures on public health delivered before the Royal College of Physicians at London by M'Vail on the subject of Smallpox and Vaccination (*Half a Century of Smallpox and Vaccination*, John C. M'Vail, Edinburgh; Livingstone) have been reprinted in a small volume which is well worthy of consideration. The author starts out to prove three things, and they are that the infectivity, the fatality and the prevalence of smallpox in England and Wales have very greatly diminished during the last half century, and particularly in the last two decades. Statistics from Low's reports support M'Vail's contention.

ENGLAND AND WALES—DEATHS FROM SMALLPOX IN DECADES.

1867-76 . . . . .	58,614
1877-86 . . . . .	18,026
1887-96 . . . . .	4,892
1897-1906 . . . . .	4,763
1907-16 . . . . .	139

The figures are, perhaps, not entirely reliable, as they have been taken from varied sources, as smallpox was not notifiable until 1889. M'Vail lays some stress on the current opinion that there are different types of smallpox now in existence. As far as England is concerned these consist of a severe form, the so-called European or African type generally imported from Northern Africa by way of Spain, France or Italy, and a mild type known as the American, imported from Canada, the United States and the West Indies. The same observation has been made in America, perhaps not so certainly as to the origin of the different types, but as to the variation in virulence, some epidemics being very mild in character while others show more the character of the smallpox of other days.

To get the correct idea of smallpox one should read the descriptions by writers who observed the disease before the introduction of vaccination. An example of such an account is the instance of the account given by Rosen von Rosenstein in his work on the diseases of children, published in 1776 (English translation). Smallpox has always been regarded as the highest type of infectious disease and Osler says persons exposed unprotected by vaccination almost invariably are attacked. From this opinion, which is current in almost all of the text-books, M'Vail differs and says smallpox has more resemblance to scarlet



fever in respect to the possibility of sporadic cases. Such cases are seen in the pre-epidemic stage and it sometimes takes a considerable period of time before an epidemic reaches any great size. The present-day conception of this phenomenon is that as the virus of the disease passes through one individual after another it increases in virulence. M'Vail also comments on the lessened amount of eruption seen in the milder and less infective types.

He brings up another question which illustrates a curious phase of the human mind; that is, the possible objection to vaccination on the ground that it makes the spread of smallpox more easy because it leads to a milder type of disease not readily recognized. M'Vail is of the opinion that this certainly should have no weight and that the present practice should be continued.

The third lecture deals with the control of the disease and can be highly recommended to health officers and students of public health.

**The Broad Tapeworm in America.** Until recently, infection with the *Dibothriocephalus latus* had been largely confined to the vicinities of large bodies of water, in northern Europe, Switzerland and northern Italy, but it also occurs in Belgium, Holland, Ireland and has been reported from Japan, Iceland and South Africa. This worm was described by Linnaeus in 1758 under the name of *Tinea lata*. In 1819, Bremser suggested the name *Bothriocephalus latus*; Deezing, in 1850, infected with the craze for adding new names to old parasites, called it *Dibothium latum*, and Davaine, impelled by similar reasons, changed the *latum* to *cristatus*. In 1899, Luehe suggested the name *Dibothriocephalus* and now Lyon<sup>168</sup> reports an instance in this country in which the parasite was imported with the host from abroad and he uses the name *Diphillobothrium latum*. Truly, as the columnist in the daily papers has it, science is wonderful.

In 1907, Stiles wrote that "it is probable that immigrants will infect the fish in some of our lake regions." That this has already occurred is true, as Parker, in 1906, demonstrated the presence of this tapeworm, as reported by Nickerson in an article on the broad tapeworm in Minnesota. The adult worm occurs in man, cats, dogs and in the larvæ stage is found in the muscles and organs of fresh-water fish. Infection in warm-blooded animals is contracted by eating raw or underdone fish. The earlier cases in this country occurred in individuals who had been infected abroad. In the State of Minnesota the parasite was found chiefly in Finns, but also in Swedes and Japs.

Nickerson<sup>169</sup> adds another contribution on the subject of infection by this parasite and states that four clear-cut cases of native infection have been reported. In three of these the infection occurred in Minnesota and in the other either in Minnesota or North Dakota. He suggests that physicians should send specimens to a parasitologist for diagnosis, or zoölogists, or the Bureau of Industry, in Washington, or to the zoölogical departments of the state universities. In this manner a large number of cases which doubtless escape accurate diag-

<sup>168</sup> Journal of the American Medical Association, March 6, 1920, p. 655.

<sup>169</sup> Ibid., February 14, 1920, p. 457.

nosis would be reported upon, but as Nickerson says, "the main question is, Can physicians be made to realize their need for such aid as I have suggested, and will they take enough interest in the matter to send in the specimens?"

I can answer the question for him offhand: "They will not."

**Trench Fever.** In *PROGRESSIVE MEDICINE* for March, 1919, I gave a rather extensive review of what is properly known as trench fever and also under a large number of other names, such as Volhynia fever, five-day fever, etc. Byam and Lloyd<sup>170</sup> have presented a study of this subject. They have summarized very well the results of their own observations and those of others. The following extracts from their conclusions will be found to state briefly about all that is known concerning the transmission of the disease.

"1. Lice that have fed on a trench-fever patient become infective to healthy men after a period varying from five to eight days from the first infecting blood feed.

"2. Conversely, lice that have fed only on healthy men are incapable of causing trench fever.

"3. Lice once infected probably remain so for the rest of their lives, and certainly up to the twenty-third day of their infection. Such lice, however, do not pass on their infection hereditarily.

"4. When infected lice feed on healthy men, a certain number of infections will be produced; though the time that such louse feeding requires to be continued before infection results is often as much as thirty days or longer. Young men react more readily to louse bites than do old men, and old men, though equally susceptible to infection when their skin is artificially broken, rarely contract trench fever when infected lice are fed on them.

"In this connection it is well to note that lice are constantly contaminated with their own excreta, masses of which may be seen, by means of a hand lens, adhering to their surface, and that, no matter what position lice are fed in, their excreta will generally reach the skin on which they are feeding, and often in a semifluid condition as the result of solution in the sweat.

"5. The excreta passed by lice, which have been fed on trench-fever patients several days previously, are capable of producing trench fever in healthy men. The minimum interval varies in different instances from five to eight days.

"6. Such infective excreta may enter the body through abrasions of the skin, particularly those resulting from scratching induced by the irritation of lice, through gunshot and other wounds, and through the healthy conjunctival sac.

"7. A very high percentage of lice eventually become infected while continuing to feed on a trench-fever patient.

"8. The excreta from a single louse or its gut contents, are capable of producing trench fever.

<sup>170</sup> Proceedings of the Royal Society of Medicine, November, 1919, Section on Epidemiology and State Medicine, p. 1.

"9. 0.1 mgm. of infective louse excreta has produced typical trench fever by inoculation subcutaneously.

"10. Lice can be infected by being fed when on an afebrile trench-fever patient while the disease is still active, as indicated by pains in the limbs, and similar symptoms. Sometimes patients who have infected lice in this way have suffered subsequently from febrile relapses, while others have not.

"11. Even as late as the four hundred and forty-third day of disease a patient's blood may remain infective and be capable of infecting lice fed on such a patient while slightly febrile. A patient showing such persistent symptoms is by no means rare, though we have not been uniformly successful in transmitting the disease from such cases.

"12. Infection probably does not take place by the mouth or by inhalation, attempts to transmit the disease by means of infective louse excreta, in such ways, have failed.

"13. The evidence against transmission by mechanical transference of blood by lice is extremely strong; and from what has been said it is obvious that a healthy person may contract trench fever without ever having had a louse upon him, being infected by louse excreta dislodged from garments or blankets, or by louse excreta conveyed as dust through the air.

"It seems, therefore, that trench fever is conveyed by the excreta or crushed bodies of infected lice; that the virus may enter through the broken skin or unbroken conjunctiva; that rubbing and scratching promote infection, but that the bites of lice may cause a sufficient lesion to enable infective material to enter the body."

**Typhoid Fever in the American Army during the World War.** If you remember the Spanish-American war the thing which strikes one most forcibly is the horrible toll taken by typhoid fever. Fourteen out of every 1000 soldiers died of the disease, and 141 per 1000 or 1 out of every 7, contracted the disease. Contrast this with the experience during the World War and you have a vivid illustration of one of the greatest of all modern discoveries. Russell<sup>171</sup> gives the figures. Voluntary vaccination in the Army was begun in 1909 and made compulsory in 1911. The ratio of cases prior to this time from 1900 on varied from 9.3 per 1000 which was the highest, to 2.94 per 1000 which was the lowest. Usually the rate was just under 6 per 1000. With voluntary vaccination there was some decrease, while with compulsory vaccination the rate dropped to a fraction of 1 case per 1000, being the least in 1913, when there was a rate of 0.04 per 1000, and the highest in 1917, when there was a rate of 0.44. It must be borne in mind that antityphoid vaccination was carried out by a personnel which had not been carefully trained in its administration, nevertheless the results obtained were very striking, one might say, almost miraculous.

The following table shows the value of the scientific control of disease.

<sup>171</sup> Journal of the American Medical Association, December 20, 1919, p, 1863.



RELATION OF MORTALITY IN THE WORLD WAR TO THAT OF  
PREVIOUS WARS.

	Number of deaths that occurred in present war, Sept. 1, 1917- May 2, 1919: average strength approximately 2,121,396	Number of deaths that would have occurred if the Civil War death-rate had obtained.	Number of deaths that would have occurred if the Spanish American War death-rate had obtained.
Typhoid fever . . . . .	213	51,133	68,164
Malaria . . . . .	13	13,951 <sup>172</sup>	11,317
Dysentery . . . . .	42	63,898 <sup>173</sup>	6,382 <sup>173</sup>

V. C. Vaughan, Jr.<sup>174</sup> has also made a study of typhoid fever as it occurred in the American forces. As is well known the incidence of the typhoid group was less than 0.1 per cent. which, when compared with the 20 per cent. of the Spanish-American War, is a remarkable showing for the usefulness of medical research. The study is based on 270 cases, every one of whom had received a triple typhoid vaccine. The disease in those vaccinated individuals ran a course similar to that seen in the unvaccinated and the positive results of cultures of blood, urine and feces were the same as with unvaccinated persons and the duration of the bacteremia appeared to be about the same. There was a mortality of about 11 per cent.

The patients infected within eight months after vaccination had the disease in what might be stated as average severity. After eight months the severity of the disease gradually increased. The onset of the disease was more frequently acute when occurring within the first month after inoculation and in 16 cases with the onset from seven to twelve days after inoculation, that is, the usual incubation period, the infection probably occurred during the interval after inoculation. Clinically, the paratyphoid infections, although mild as a group, could not be distinguished from the straight typhoid and they were of much less frequent occurrence.

It seems probable that a very large number of vaccinated individuals were infected with the typhoid bacillus or others of the same group, but never became sick enough to require admission to the hospital; in other words, they did not develop clinical typhoid.

The most interesting part of the report is, perhaps, that which deals with the causes of failure of the vaccination. These Vaughan groups into six headings:

The first of these is the absence of either total or partial vaccination, not on account of a vaccination that was not obtained, but because the individual failed to react. It is a common observation that different persons form different amounts of agglutinins after the vaccination, but the agglutinin titer is not a measure of immunity. There is, at the present time, no criterion which can be used to determine the degree of immunity present, or whether the individual is actually immunized or not.

<sup>172</sup> Includes malaria, remittent and congestive fevers.

<sup>173</sup> Includes dysentery and diarrhea.

<sup>174</sup> Journal of the American Medical Association, April 17, 1920, p. 1074, and April 24, 1920, p. 1145.

The second cause is new strains of the organism against which the vaccine does not immunize, but neither serologic or cultural studies have brought forth any positive information on this point, although it is, of course, a possibility.

The third is the failure of proper inoculation which can, perhaps, be dismissed, inasmuch as the work was done for the most part under favorable circumstances and by men thoroughly familiar with the technic. Compare Russell's statement given above.

The fourth cause is an overwhelming dose of the infecting organism. It is well known that there is no such thing as absolute immunity to human disease. The highest immunity that can be produced by artificial means will only protect within certain limits and if an exceedingly large dose of the vaccine is introduced it may be sufficient to overcome the protective forces of the body.

The fifth cause Vaughan calls backhanded typhoid, antibody exhaustion or immunity exhaustion. The present conception of typhoid is that of a primary systemic infection and while the organisms entering by way of the gastro-intestinal tract enter the circulation they do not primarily grow as saprophytes in the alimentary canal. Some may reach the liver through the portal circulation and some enter the general circulation. Those in the general circulation develop and after the usual period of incubation cause typhoid fever, while the organisms excreted in the bile may lodge in the gall-bladder and growing there, produce a carrier condition even though the host has not had typhoid fever. In an individual who has been successfully vaccinated, the organisms that enter the portal circulation are either broken up and destroyed by the body ferments or excreted in the bile or both. They may find a suitable place to grow in the gall-bladder and may multiply profusely even though the host be highly immune. The number of organisms that are thus continually discharged in the bile and reabsorbed through the intestinal mucosa make unusual demands on the immunity mechanism through constant and exhausting action. In addition to this, there may be a local enteritis caused by one of the typhoid colon group or other organisms which renders toxic absorption more easy. These conditions, plus the hardships of war and army life, exposure, improper food and fatigue and, perhaps at last, some intercurrent disease and infection, may wear out the body immunity. This condition Vaughan has designated in common language as backhanded typhoid. While it has been impossible to obtain convincing experimental evidence of its presence in France, there seems to be a sufficient amount of indirect evidence which warrants the conclusion.

The sixth reason of failure is the use of an unsatisfactory vaccine, either as regards antigen properties or the number of doses administered. There is considerable experimental evidence to show that the more inoculations given the greater the immunity, thus four injections confer a greater degree of immunity than do three. The individuals in the United States Army received, for the most part, the same vaccine and the same dosage and the same number of inoculations and, for the most part, it gave a satisfactory protection which, as Vaughan states, may not be ideal, but is thoroughly practical.

**Weil-Felix Reaction in Typhus Fever.** Anyone interested in this subject will do well to read the article by Wilson.<sup>175</sup> This article not only summarizes Wilson's work on the subject, but contains a very valuable bibliography. The title of the article is the Wilson-Weil-Felix Reaction in Typhus Fever. Inasmuch as other authors have not used the name Wilson in designating it, Wilson believes that his name should be added before the others, as in 1908 he established the presence of heterologous agglutinins for intestinal bacilli in the blood serum of typhus fever cases and he regards the recent work as an amplification of what he started.<sup>176</sup>

The Weil-Felix reaction I commented on last year. The test is similar to the Widal reaction in typhoid and consists in testing the agglutination power of the patient's blood serum on a suspension of bacilli obtained from cases of typhus fever. These organisms, in all probability, belong to the proteus group and are short, Gram-negative organisms, slightly motile, forming blue colonies on Conradi-Drigalski medium and pink ones on Endo-medium. These bacilli ferment dextrose and curdle milk and develop an acid reaction in litmus milk and liquify gelatin. The reaction is reasonably constant and some workers secure positive results in as high as 97 per cent. of their cases.

The test is made by taking the bacillus from an agar-slant growth, suspending it in a small amount of 0.9 per cent. salt solution and mixing this in a proportion of 1:25 and 1:50 of serum from the suspected case. Hanging drops of these dilutions are then examined microscopically after half an hour's incubation at 37° C. In positive cases, agglutination should take place in dilutions of 1 to 25 on the sixth day, and by the twelfth day in dilutions of 1 to 200 or higher.

The Health Department of New York<sup>177</sup> states that the clinical diagnosis of typhus may be made on the following findings:

"Persistent frontal headache for ten to fourteen days; fever, coming on with the headache and persisting with it, showing small daily remissions, usually of a degree or less; dark macular rash, developing petechiæ on trunk or extremities, coming out from the third to the fifth day of fever, and persisting about one week; rapid breathing—40 to 60 per minute without lung lesion, other than possibly slight hypostatic congestion. When cases, showing the above manifestations, clear up in every way by semicrisis toward the end of the second week, a diagnosis of typhus has been made.

**Yellow Fever.** ETIOLOGY OF YELLOW FEVER. As was noted last year in the consideration of the observations of Noguchi, what appears to be the organism causing yellow fever has been isolated. This is a filtrable microörganism belonging to the genus leptospira, and which Noguchi has given the name *Leptospira icteroides*. It is isolated from the blood and organs of human beings suffering with the disease and caused in certain animals characteristic symptoms and lesions observed

<sup>175</sup> Journal of Hygiene, July, 1920, p. 115.

<sup>176</sup> Ibid., 1910, x, 155.

<sup>177</sup> Weekly Bulletin of the Department of Health, City of New York, October 23, 1920, p. 337.



in the patients from whom it was isolated. He also showed that the serum from patients recovering from an attack of yellow fever had the power to agglutinate and dissolve the organism when introduced into the peritoneal cavity of a normal guinea-pig (Pfeiffer phenomenon), and also that guinea-pigs that had once been inoculated with the blood of yellow fever patients without succumbing to the infection were found to be refractory to a subsequent inoculation of the organism. The fact that the organism is filtrable and may be transmitted by the *Stegomyia calopus* strengthens the view that it is the cause of the disease. The organism is very closely related to the *Leptospira icterohemorrhagiæ*, and Noguchi,<sup>178</sup> in his tenth contribution on the subject of the etiology of yellow fever, has published some comparative immunological studies of these two organisms.

A blood serum from an animal naturally refractory to infection by the *Leptospira icteroides*, and in which several successive injections have been made, possesses the power to agglutinate *in vitro* not only the homologous strains, but also all other strains of *icteroides* tested. While little or no effect has been observed when the immune serum has been mixed *in vitro* with various strains of *Leptospira icterohemorrhagiæ*, a similar relation exists between the monovalent anti-*icterohemorrhagiæ* and the various strains of *Leptospira icteroides*. The Pfeiffer reaction, however, gives a sharper differentiation between the two groups, usually being specific.

Using polyvalent immune sera, one specific for the *icteroides* and the other for the *icterohemorrhagiæ*, a higher titer of neutralizing power was demonstrated. It was found, however, that the action of the sera is by no means actually specific, because the injection of a sufficient amount of the anti-*icteroides* serum apparently prevented a fatal outcome in a guinea-pig inoculated with multiple minimum lethal doses of a culture of *Leptospira icterohemorrhagiæ*, and *vice versa*, but, when smaller quantities of the serum were used, the action seemed to be specific.

A study of the active immunity was found difficult owing to the existence of a natural resistance to infection among guinea-pigs. It was found that guinea-pigs that had once passed through an attack of *Leptospira icteroides* were immune to a second infection with the same organism, but reacted severely, and sometimes fatally, to an injection with *icterohemorrhagiæ*. In some instances, however, a considerable resistance to infection with *icterohemorrhagiæ* was noted as compared with those which had never been inoculated with *icteroides*. There is not much doubt, therefore, that an attack of *icteroides* brings about, in some degree at least, a certain resistance to the *icterohemorrhagiæ* infection.

In his eleventh contribution, Noguchi<sup>179</sup> considers the serum treatment of animals infected with *Leptospira icteroides*. He found that the use of a polyvalent immune serum of high potency was of definite advantage in checking the progress of the infection. When admin-

<sup>178</sup> Journal of Experimental Medicine, February 1, 1920, p. 135.

<sup>179</sup> Ibid., p. 159.

istered during the period of incubation, the serum was found capable of completely preventing the development of the disease, although later hemorrhagic lesions of greater or less number and extent were found in the lungs of the guinea-pigs which survived. In addition to this, the serum, when used in the early stage of the infection, modified the course of the disease and prevented a fatal outcome, but when used at a later stage, when jaundice and nephritis had been present for several days and the animal near collapse, the serum had no beneficial effect.

CHEMOTHERAPY VERSUS SEROTHERAPY IN EXPERIMENTAL INFECTION WITH *LEPTOSPIRA ICTEROIDES*. The twelfth contribution on the etiology of yellow fever by Noguchi<sup>180</sup> gives his experiences in studying guinea-pigs variously infected with different amounts of *Leptospira icteroides*. Some were given enough to produce mild infections, while in others as many as 50 minimum lethal doses were used.

The use of salvarsan and neosalvarsan in this experimental icteroides infection was found to be of doubtful value and suggest the similar results obtained by various investigators in using the same drugs in treating infections with the *Leptospira icterohemorrhagiae*. Both drugs were found to be highly poisonous for the organisms and stopped their growth when added to the culture medium in a concentration of 1:200,000. The effect on killing the organism was slow and the highest dilution which killed them in eighteen hours was somewhere near 1:200,000. The serum from rabbits that had received 0.05 grams of salvarsan or neosalvarsan per kilo of body weight one hour before bleeding affected the leptospira, causing sluggishness at the end of eighteen hours and death and degeneration after forty-eight hours, whereas in normal rabbit serum the organism thrived.

Noguchi also found that anti-icteroides horse serum in a dose of 1 c.c. in a 1:10,000 dilution protected guinea-pigs from an infection with at least 5000 minimum lethal doses of the *Leptospira icteroides* when injected simultaneously, but mixed together *in vitro* the same serum failed to exert any injurious effect upon the organism in a concentration weaker than 1:2000. Noguchi concludes, therefore, that practical advances in the future will probably be made along the line of serotherapy rather than chemotherapy.

THE CLINICAL SIDE OF YELLOW FEVER. Yellow fever has become so rare in the United States that our interest is fast becoming of an academic nature. It may not be out of place, therefore, to comment briefly on a clinical study of the disease as made by Elliott.<sup>181</sup> He had the opportunity of studying about 70 cases in Guayaquil, in Ecuador. The disease is endemic in this town; while there is no information as to the total number of cases there were many and of all grades of severity. During the year 1917 there were 226 patients admitted, of which 67 died.

The most striking thing about the disease clinically is the rapid onset. The fever is usually low and of short duration, accompanied

<sup>180</sup> Journal of Experimental Medicine, October 1, 1920, p. 381.

<sup>181</sup> Archives of Internal Medicine, February 16, 1920, p. 174.

by slow pulse, congestion of the face, scleræ and gums. There is a following period of apparent intoxication with increasing changes, hemorrhages and nephritis, it being Elliott's experience that the patients either died or made a complete recovery promptly. In mild infections recovery had taken place by the end of the first week, while in the severe ones by the end of three weeks. The fatal cases died between the fourth and eighteenth day, and on the average, on the eighth day.

There are two periods, the first of invasion lasting four or five days, during which there are such general symptoms as fever, congestion, headache, backache, epigastric and general abdominal pains and tenderness, nausea and vomiting, and tenderness of the muscles. The gums are swollen, the patient is restless and apprehensive. The secondary period is one of degeneration, during which the patient is very toxic, relaxed and weak; there is marked jaundice, nausea and vomiting, often the characteristic black vomit, as well as hemorrhages from any of the mucous membranes or into the skin. There are frequently symptoms of uremia, diminution of urine or complete anuria, stupor, coma or convulsions. There is marked albuminuria together with the presence of blood and casts. In the severest cases the odor from the mouth is very much like that of the dead horse.

The blood shows little that is characteristic, usually the count is normal, sometimes there is a slight leukopenia and usually late in the disease, especially in moribund patients, there may be an increase in the white cells, from 13 to 49,000. The blood-pressure is found uniformly low, 110, with a diastolic of 65 or less.

The chief diagnostic features are, first, the fact that the native physicians of Guayaquil consider it practically impossible that a child born there could grow up without having the disease and so become immune if it lives; or that a susceptible adult could live there very long without becoming infected. The low continuous fever with relative bradycardia with nausea and vomiting, black vomit, epigastric pain and tenderness, the rapid and progressive development of nephritis, the flushed face and conjunctivæ and swollen and bleeding gums and gradual and progressive jaundice, apparent in the conjunctivæ as early as the third day, all make a picture that it is difficult to mistake, with the exception of one disease and that is malaria. In this disease the temperature is higher and the plasmodium can generally be demonstrated. The greatest difficulty was encountered in the cases of malaria in which yellow fever subsequently developed.

Yellow fever is one of the diseases which it seems possible to eradicate if intensive campaigns are made against the mosquito and the work of the Rockefeller Commissions has already done much to rid the world of this horrible plague.





# DISEASES OF CHILDREN.

BY STAFFORD McLEAN, M.D.

**The Newborn.** Rodda's<sup>1</sup> observations from the "Newborn Clinic" of Minneapolis are some of the most important seen by the reviewer in 1920. He has done much to correct our previous conception that cerebral hemorrhage in the newborn is generally due to some difficulty in the birth of the child, and in some way connected with faulty obstetrics. His postmortem examinations show that 50 per cent. of all deaths at birth occur as a result of cerebral hemorrhage. Many of these deaths followed non-instrumental, and occurred frequently in easy, deliveries. They were, however, especially frequent following breech deliveries and in premature births. Craniotomy was performed in 2 cases of cerebral hemorrhage, with successful results; in 1, the patient was normal at ten months of age, and the other, which was last seen at the age of four months, was also normal.

The author reviews the *theories as to the etiology of cerebral hemorrhage*.

1. Stretching and tearing of the tentorium resulting from elongation of the skull.

2. Rupture of veins over the vertex from overriding of the cranial bones or as a result of congestion and backing up of blood in the cranial vessels.

3. Rupture of the longitudinal sinus or veins emptying into it with blood collecting over the cerebrum.

4. Rupture of the transverse sinus and release of blood over the cerebellum.

5. Rupture of vessels of the choroid plexus with the accumulation of blood in the ventricles.

The frail vessels and compressible head of the premature infant might account for the frequency of cerebral hemorrhage in the newborn. The massive hemorrhages which cause the death of infants in the first few hours of life, the author believes, are due to rupture of large veins, sinuses or tears of the tentorium. He quotes studies of frozen sections of the skull which support his theories. His study covers the majority of infants who died or were operated upon following hemorrhage in which there was no demonstrated source of bleeding, such as torn veins or rents in the sinuses. More than 25 per cent. of these showed multiple hemorrhages. From his findings he concluded that there were factors other than trauma in birth hemorrhage. One of these factors was disturbed coagulation time. He learned that there is a prolongation of coagulation and bleeding time up to the fifth day, with a return to the average

<sup>1</sup> The Coagulation Time of Blood in the Newborn, Journal of the American Medical Association, August 14, 1920, lxxv, 7.

before the tenth day. In his cases evidence of hemorrhage appeared when a prolonged bleeding time accompanied a delayed coagulation time. Delayed bleeding time and coagulation time were favorably affected by the subcutaneous administration of whole blood. In icterus neonatorum, normal coagulation and bleeding times were found. Several cases of melena neonatorum showed coagulation time up to ninety minutes.

He believes that the coagulation time and bleeding time should be determined in every newborn presenting unusual symptoms. If reactions are delayed, whole blood should be administered.

A description of Rodda's<sup>2</sup> technic for determination of the clotting time is incorporated here, with the hope that it may be more widely used. Its simplicity makes it available to practitioners for use at the bedside and in out-patient work. My experience with this method is limited, but I should judge that it fulfils the claim the author makes for it.

His apparatus consists of a spring lance by which the depth of the incision may be regulated, (two  $2\frac{1}{2}$ -inch watch-glasses) and No. 6 lead shot. The heel of the infant is used and the lance set at 0.5 cm., which depth will allow a flow of blood without pressure and without admixture of tissue juices. A clean watch-glass containing a No. 6 lead shot receives the second drop of blood and the other watch-glass is inverted over the first. The watch-glass is tilted every thirty seconds until the shot no longer rolls but is fixed in the clot. The glass may then be inverted without dislodgment of the clot. The author makes no claim that the absolute clotting time is obtained, but the results show a clean-cut relative time for comparative work and gross variations from a normal range.

The average clotting time of 126 newborn infants within the first twenty-four hours of life was seven minutes, giving an approximate range of from  $5\frac{1}{2}$  to  $8\frac{1}{2}$  minutes, or roughly from five to eight minutes. A clotting time of more than ten minutes presents delayed coagulation. It was noted that the coagulation time varied on different days of the infant's life, showing a tendency to prolongation over the second, third and fourth day, with a maximum on the fifth day and a return to the time obtained during the first twenty-four hours before the tenth day.

Foote<sup>3</sup> makes some interesting observations on cerebral hemorrhage in the newborn, but conveys the impression that the diagnosis is readily made. In many of the cases of this type the diagnosis is extremely difficult, almost as difficult as the interpretation in the first few months of life of the significance of spasticity, whether it means a cerebral lesion or hypertonia?

The more frequently one sees these cases the more one is impressed with the difficulties surrounding the making of a definite diagnosis. There is no harm in the injection of whole blood or serum in newborn

<sup>2</sup> Studies with a New Method for Determining the Coagulation Time of the Blood in the Newborn, *American Journal of Diseases of Children*, April, 1920, No. 19, iv, 269.

<sup>3</sup> The Hemorrhagic Tendency as a Frequent Cause of Cranial Hemorrhage of the Newborn, *American Journal of the Diseases of Children*, July, 1920, xx, 1.



children. When there is the slightest suspicion of birth hemorrhage, it should be employed.

Foote reports that he performs lumbar puncture on all newborn infants showing, within twelve to twenty-four hours after birth, respiratory distress and blueness, with or without muscular rigidity and twitching. In every instance where these symptoms were observed within twenty-four hours after birth, the lumbar puncture showed amounts of blood varying from a deep to a bright claret color and occasionally small clots. In these cases the author used horse serum and thromboplastin hypodermically; 1 of the infants died and the other 6 recovered. In 1 case only was the lumbar puncture repeated; 6 of these, which he had been able to trace, seemed normal in every way. Respiratory distress and blueness are suggestive of cranial hemorrhage, but these symptoms alone are far from conclusive. In the author's series of lumbar puncture, only one was repeated, and it is to be regretted that it is not stated whether it also showed blood-stained fluid. It is not infrequent, in spinal puncture in infants, to have the needle enter a small vein and have bloody fluid run out of the needle. It is perhaps not wise to make a diagnosis of cerebral hemorrhage in the newborn on one puncture showing blood-stained fluid. The puncture showing blood should always be repeated.

The author states that "hemorrhage may occur in the infant's skull, produce all the classical symptoms, and yet be followed by apparent recovery without any special treatment directed toward blood coagulability or the relief of pressure." He cites 2 such cases, 1 which is now six, the other four years of age; both are normal children. He quotes Wehe<sup>4</sup> who found that 12 per cent. of 959 infants at necropsy showed evidence of having had hemorrhage.

Sidney<sup>5</sup> gives an interesting summary of the causes of birth hemorrhage, but attributes the condition to difficult delivery and makes no mention of conditions in the child which might be the cause of bleeding. He quotes Monroe who reported 40 autopsies on infants dying within a few days after birth in which he found 10 cases of rupture of the tentorium and 5 of the falx cerebri. In all of these cases death was due to hemorrhage following the rupture. In one of his 5 cases some of the findings were the following: The child weighed six pounds at birth, and the labor was induced and forceps used. Five days after birth the child had repeated convulsions. In lumbar puncture, of 3 c.c. of fluid withdrawn, two-thirds was pure blood. There were no further convulsions. For four successive days lumbar punctures were repeated; during which time the fluid was clear. The child was twenty months old when last seen, and was normal in every way. Sidney contends that spinal puncture should be done more frequently, in the belief that it might not only relieve symptoms but even cure the patient.

Sidney's point of view is different from the authors previously quoted and for that reason is here mentioned. Whether hemorrhage in the newborn is more frequently due to difficult labor and the use of forceps

<sup>4</sup> Inaug. Dissert., Kiel, 1889.

<sup>5</sup> The Importance of Lumbar Puncture in the Intercranial Hemorrhage of the Newborn, *Archives of Pediatrics*, September, 1920, xxxvii, 9.

or to conditions in the child favoring hemorrhage will be difficult to settle. After all, in many of the cases, the discussion is merely an academic one. I have heard Oppenheim state that it is not the application of forceps which is the chief offender in causing birth hemorrhage but the conditions arising in the course of labor which indicate the use of forceps. The pediatricist's responsibility is chiefly in the earliest possible diagnosis of cerebral hemorrhage and the institution of the proper steps necessary in each individual case. In a limited number of cases where the diagnosis of a large hemorrhage is definite, operation, in the hands of a skilful operator, may be indicated. There are few surgeons who have had the necessary neurological training. In most of the cases it seems wiser to trust to indirect means to control the bleeding.

Regarding the "Arrest of Hemorrhage," an editorial<sup>6</sup> which appeared recently is in part here quoted as it throws additional light on this disputed problem.

"The clotting of blood is a complicated process, the explanation of which is still being debated. The importance of the problem involved can scarcely be denied, however, for it concerns not only the natural arrest of hemorrhage from wounded bloodvessels, but also the management of the dangerous conditions that may arise in hemophilia. One indispensable factor in coagulation is the formation of the insoluble protein fibrin from the antecedent fibrinogen existing in solution in the plasma. There is a second generally admitted essential agency, known as the fibrin ferment, or thrombin, which is not present, in active form at least, in the circulating blood, but is formed when the blood is shed. Sometimes, under abnormal conditions, it arises within the bloodvessels, so that an intervacular clot may appear. When one begins to inquire how and when the fibrinogen, thrombin and other less generally admitted factors interact to produce coagulation of the blood, the uncertainties and conflicts of current hypotheses are at once brought to notice."

The possible relation of hemophilia to hemorrhage of the newborn has not been considered by the authors herein mentioned. It is true that hemophilia rarely manifests itself until the child is two or three years of age, but, in the light of our more recent knowledge of blood conditions, it seems possible to assume that there may be some connection, in certain instances, between hemophilia and hemorrhage of the newborn. In view of this possible association, some results of Weil's<sup>7</sup> experience with hemophilia are quoted.

He states that formerly only 11 per cent. of the young with hemophilia reached the age of twenty-one, but at present the prognosis has greatly changed owing to serum therapy. Among his own patients during the last fifteen years, he has not had a fatality among more than 50 such patients. The tendency to hemophilia, he finds, is clinically corrected by subcutaneous injection every two weeks of 20 c.c. of animal or human blood serum. The serum has pronounced local action, stopping hemorrhages in hemophiliacs when gauze soaked in serum is applied to the bleeding point after the wound has been cleaned of clots. He does not

<sup>6</sup> Editorial, *Journal of the American Medical Association*, July 3, 1920, lxxv, 1.

<sup>7</sup> *Familial Hemophilia*, Médecine, Paris, March, 1920, i, 6.

use transfusion of blood because it is too complicated for frequent use. Weil feels that thyroid, ovarian, suprarenal glands, calcium chloride and gelatin have no place in the treatment of familial hemophilia. He suggests that hemophilia must be regarded as a congenital functional malformation of the elements in which the blood and the vessels originate.

Jurasz<sup>8</sup> refers to Stephan's discovery that *irradiation of spleen with roentgen rays* shortens the coagulation time of the blood. He points to the possibility that the spleen may be the central organ with respect to the blood coagulation process. He recommends that the coagulation time be determined before operation, and if it is retarded four to five minutes it indicates some disturbance of the coagulation process and irradiation of the spleen should precede the operation. In his experience, fifteen to twenty hours preceding is the most favorable time.

If these findings above noted are reliable, this opens up one more avenue of checking hemorrhage in infants, particularly in hemorrhage of the newborn. In the light of our present knowledge, it is not the method of choice, but, if the other measures, such as injection of whole blood, of serum and blood transfusion fail, it might be given a trial.

Voncken<sup>9</sup> makes an interesting reference to the quest of investigators for missing element necessary for the production of a normal clot. He notes the efficacy of human serum and the employment of fresh blood to the bleeding wound. He quotes Nolf who considers the action of serum as that of an antigen, and to obtain coagulation, he says, it is necessary to have the combined action of three colloids: fibrinogen, thrombozyme and thrombogen, these colloids uniting to form fibrin and thrombin. He mentions that Bienwald injected blood from a healthy subject into the depth of a bleeding wound of a hemophiliac. Coagulation set in and the hemorrhage was arrested. He quotes a communication of Chalier who noted the efficacy of injections of maternal blood in cases of hemophilia, in one case of long standing hemorrhages, recurrent hemarthrosis, and hematuria was cured following 11 intravenous injections of 25 to 40 c.c. of serum derived from the mother's blood.

In Voncken's own case there was a penetrating wound of the right lobe of the liver which had a tendency to hemorrhage. This cleared up under homohemotherapy or in injections of whole blood from a healthy subject.

Aschenheim<sup>10</sup> opposes the tendency to consider splenic anemia as belonging to a subordinate group of the ordinary anemias in infants and young children. He contends that it is a clearly defined disease characterized by a very large spleen, a yellow color of the skin, swelling of the liver, and frequent edemas and hemorrhages.

This point seems well taken. Acute nephritis in children is often accompanied by secondary anemia, frequently of a severe grade. Ac-

<sup>8</sup> Influence of Spleen in Blood Coagulation, Zentralbl. f. Chir., xlvii, 27; abstract, Journal of the American Medical Association, September 25, 1920, lxxv, 13.

<sup>9</sup> Homohemotherapy, Journal of the American Medical Association, July 31, 1920, lxxv, 5.

<sup>10</sup> Splenic Anemia in Children, Deutsch. med. Wchnschr., March 18, 1920, xli, 12; abstract, Journal of the American Medical Association, May 22, 1920, lxxiv, 21.



quired cardiac disease in children is also complicated, in many instances, by secondary anemia. Many of the acute and chronic infections are complicated by anemia, yet these conditions are never associated in the minds of clinicians with blood conditions. In splenic anemia, at least in the late stages, the lesion is essentially a periportal cirrhosis of the liver. The anemia is essentially a secondary anemia. Attention is called to the condition of the child on account of the dyspnea caused by the anemia which is probably the reason for thinking of the disease as a blood condition.

In regard to *transfusion of infants*, a warning is here given in the form of an abstract of an article by Happ.<sup>11</sup> The isoagglutination of 131 infants and children from birth to ten and a half years was determined by him by testing their serum and washed corpuscles microscopically against the serum and washed corpuscles of each of four adult groups. He found that, at birth and during the first month of life, isoagglutination is rarely present, but the condition increases with age, so that after one year the group is usually established and after two years it is always present as in adults. On account of the difference between the agglutinative reactions in the blood of mother and child, it is not safe to transfuse an infant from its mother without making the preliminary tests. A few years ago I sent a questionnaire to several hematologists among my acquaintance regarding the question of whether it was advisable to transfuse a newborn infant with the mother's blood without performing the customary tests. All the answers were the same; the younger the infant, the fewer the chances for agglutination or hemolysis, but, to be absolutely safe, it was wiser to make the tests.

**Maternal Nursing.** There have been numerous articles during the last twelve months on maternal nursing. None of them contain any specific information which is suitable for abstraction here, but I cannot let the opportunity go by without making a plea to the general practitioner to insist that more of the mothers in his practice nurse their babies. It is the physician who is at fault and not the mother. There is an erroneous impression prevalent among physicians that the American mother does not desire to nurse her baby. In a number of years' experience in private practice and in out-patient work in New York City, I have rarely seen a mother who did not desire to nurse her baby. I have seen some who could not, but the majority of the mothers of bottle babies have told me that the infant was taken off the breast by the direction of the family physician. Many of these babies were weaned after a most casual history of the case had been taken, and evidently for most trivial reasons. Many infants who have been weaned for trivial causes I have succeeded in reestablishing again on the breast, in some where breast feeding had been omitted over a fortnight's period.

Many an infant has been weaned who was regurgitating on too frequent feedings. I have seen some who were weaned because they were having frequent stools, although gaining in weight. Frequent

<sup>11</sup> Appearance of Isoagglutinins in Infants and Children, *Journal of Experimental Medicine*, March 1, 1920, No. 31, iii, 313.

stools in breast-fed infants have little significance as long as the child is gaining weight in sufficient amounts.

The trouble lies primarily with the medical schools where so much stress is laid on artificial feeding that the student goes into practice with a knowledge of artificial feeding but with little or no knowledge of the regulation of breast feeding. Every student should be taught that every mother can nurse her baby and let him learn otherwise in the exceptional case.

It is true that some mothers are only able to successfully nurse their infants two or three months, but even a three months period of successful nursing is of tremendous value. Many mothers are not able to furnish enough milk to supply the entire wants of the child; with these, complementary or supplementary feedings, sufficient to make up the deficit, should be instituted and the mother encouraged to produce what she can. A cheerful optimistic physician who tells the mother she can, and must, nurse her infant will more likely achieve the desired result than the physician who depends for success upon complicated diets and forced feedings.

**The Teeth.** Snyder<sup>12</sup> justly declares that pediodontia is still in its infancy but merits development, that the care of the child's teeth is a subject that until recently was ignored by the pediatricist and neglected by the dentist and, furthermore, the care of the child's teeth is a matter in which the pediatricist should assume greater responsibility. He notes that it has been estimated in New York City that 98 per cent. of all children, when they reached the first grade in school, had bad teeth and one-third had abscess conditions. He believes that the premature loss of deciduous teeth was the most frequent cause of malocclusion and deformities of the face and jaws.

Sedgwick, who discussed the paper, reported a case of supposed malaria which had cleared up when the teeth had been properly cared for. DeBuys noted a slightly elevated temperature in the mouth of those who had dental caries over a long period.

Too much cannot be said about the care of the child's teeth. The responsibility lies with the physician, but it is necessary to secure the coöperation of the parents and the dentist; the parents for preventive measure to encourage brushing the teeth of even young children after each meal; dentists to really take an interest in the teeth of children. Very few will tolerate a screaming child among their waiting patients and will cheerfully say that it is better to wait a few years rather than attempt anything at the present. Every child with a carious tooth is as deserving of dental service as an adult with a severe toothache. To repeat an old axiom, "Every tooth is either good enough to fill or poor enough to pull."

It is unfortunate that children do not have pain with disease of the deciduous teeth such as adults have with the permanent set; if pain were commonly present, advice of the family dentist might be sought before the teeth are so far gone that the only possible procedure is extraction.

<sup>12</sup> The Temporary Teeth, Disorders Due to Their Neglect, Archives of Pediatrics, June, 1920, xxxvii, 6.

During the past year I have received announcement cards from several pediatricists in different cities stating that they have allied themselves with surgeons, internists and pathologists in forming medical clinics. In my opinion the ideal coöperative venture would be the association of the pediatricist with a dentist, a laryngologist and a pathologist. A clinic for children, whether free or for profit, cannot be considered 100 per cent. efficient without the close coöperation of a dentist. Many of our hospitals have a consulting dentist who, in my experience, is too rarely consulted. The function of the dentist connected with a hospital or dispensary, and particularly the latter, should be intimate, he should have his regular hours for visiting, quite the same as the medical and surgical attendings. In this connection I might venture to state that the repair of hare-lip and cleft-palate is in the domain of the dentist rather than the surgeon. Many dentists perform these operations and many more would if they had the opportunity. Dentists are more accustomed to work in a smaller area than surgeons; with proper training, I feel reasonably sure they would secure better results.

Guthrie<sup>13</sup> gives an interesting account of the important results achieved in a dental clinic for children in New Orleans. Based on the opinion of the social workers, there was a marked reduction in the number of cases of infectious diseases among the children who "belonged" to the clinic.

Two specific groups of children were studied, one known to be tuberculous and one known to be syphilitic. In the first group 95 per cent. of the deciduous teeth had to be removed before the eighth year on account of abscesses, in the second group only 4 per cent. had to be removed.

In cases of ulcerative stomatitis, he recommends the use of dichloramin-T solution in water, 1 to 1000, as a mouth wash. Guthrie further states that in the management of a child's dental clinic success depends on securing the return of the child regularly for inspection and, if necessary, for treatment. The clinic should be a necessary part of the child's life and he must feel that he must attend as regularly as he attends school.

**Protein Reactions.** Park<sup>14</sup> reports an unusual case of *hypersensitiveness to cow's milk* which I have reported in detail on account of the value of his technic of desensitization. His case was a nursing baby, six weeks old. He was fed one ounce of cows' milk, which had been boiled for five minutes, 2 ounces of boiled water and  $\frac{1}{2}$  level teaspoonful of cane sugar. Although he had not taken more than 2 c.c. of the mixture, severe reaction, with vomiting, drowsiness, etc., followed. At ten weeks he was given cows' milk again and symptoms similar to the first attack followed, plus prostration and loose stools containing mucus. When twelve weeks old a skin test for hypersensitiveness to cows' milk was negative, but it resulted in vomiting and two loose stools four hours after the test. Goats' milk fed to the child produced no symptoms. At

<sup>13</sup> A Dental Clinic for Children in a Settlement, Journal of the American Medical Association, November 6, 1920, lxxv, 19.

<sup>14</sup> A Case of Hypersensitiveness to Cows' Milk, American Journal of the Diseases of Children, January, 1920, xix, 1.



three months intracutaneous tests of protein were given, with the result that there was no reaction at the end of thirty minutes, but that three and a half hours after injection the baby awoke from a heavy sleep, vomited twice, was prostrated and very sick. Considerable induration was then observed at the point of injection of cows' milk. Goats' milk was then established as a regular diet. At another time the child was ill as a result of eating a small piece of bread which had been made with milk. Another skin test for cows' milk was positive when the baby was nine and a half months old.

At twenty months of age one drop of cows' milk was given, with no bad result. The following day, November 5, 2 drops were given, and on November 6, 4 drops. As a result he was ill, slept for some time, but did not vomit. Five drops on November 7 gave the same results. After 10 drops on November 8 the child was pale and slept one-half hour. On November 9, 15 drops produced paleness but no drowsiness. Thirty drops were given on November 10, and 60 on November 11. There were no symptoms on either day. On November 12, 7.5 c.c. were fed to the baby. One hour later he was pale, slept for ten minutes and was then normal again. Ten c.c. on November 13 produced no symptoms. The amount was increased 1 c.c. daily. By December 10, he took  $\frac{1}{2}$  liter. Goats' milk was then omitted altogether.

The child is at present three years old, is well and drinks one pint of cows' milk daily. While he does not dislike it, he does not particularly care for it. Park believes that hypersensitiveness to cows' milk in an infant who never received it before must be regarded as prenatal, must be inherent in the germ plasm.

Blackfan<sup>15</sup> believes that successful therapeutic results may be expected in patients unable to take certain foods without the development of eczema, urticaria, asthma, etc., if the patients are hypersensitive to protein and the treatment is thoroughly carried out. This may be done by omitting the offending food from the diet or by desensitization of the patient.

There is scarcely a pediatricist who has not a selected group of proteins in his office which, from time to time, he uses in tests for hypersensitiveness in certain cases. It is not to be denied that this adds a certain interest to the practice of pediatrics, and now and again it is of value. On the whole, my experience has been a disappointing one. One commonly finds children reacting to protein they have never had and failing to react to ones which are included in their dietary. In others, one finds reactions to one or more proteins which omitted from the dietary cause no relief of symptoms. The problem of desensitization rarely confronts the pediatricist insofar as food proteins are concerned, but for scientific interest there are few problems which are more fascinating.

Fleischner, Meyer and Shaw<sup>16</sup> quote Krause, who carried out a set of

<sup>15</sup> Protein Hypersensitiveness in Children, American Journal of the Medical Sciences, September, 1920, clx, iii.

<sup>16</sup> A Résumé of Some Experimental Studies on Cutaneous Hypersensitiveness, American Journal of the Diseases of Children, December, 1919, xviii, 6.

important experiments; he injected guinea-pigs with two strains of tubercle bacilli, one very virulent and the other very weak. The first group showed increasing cutaneous hypersensitiveness from eleven days after the injection to the forty-sixth day, when the disease was well advanced. In the animals injected with the weak strain, the reaction increased as the disease developed; after it came to a standstill and began to heal the cutaneous hypersensitiveness became milder, the ability to react never entirely disappeared.

He concludes that (1) cutaneous hypersensitiveness is never present without a focus; (2) it appears coincidental to the establishment of the focus; (3) it diminishes with the healing of the focus; (4) it varies with the virulence of the invader; (5) it is probably never entirely lost except in the presence of pregnancy or intercurrent disease; (6) it is increased by reinfection; (7) it is diminished or entirely wiped out during a period of general tuberculin reaction. The suggestion is offered that tissue hypersensitiveness may be a function of immunity to reinfection.

Scheppegrell<sup>17</sup> states that 5 per cent. of *hay fever* cases develop before the age of five and 24 per cent. before the age of twenty-four years. He thinks that hay fever is not recognized in children, the condition being called a "cold." The initial sensitization of hay fever pollen in children is usually due to the direct inhalation of certain wild flowers; the common ones are the daisy fleabane (*Erigeron strigosus*) and the common dandelion (*Leontodon taraxacum*).

The field daisy and black eye susan are insect pollinated, but if applied directly to the nostrils, anaphylaxis may develop; this may result in a sensitization to other members of the same group. Asthma is sometimes the predominant symptom of hay fever in children.

Donnelly<sup>18</sup> treated 28 patients with *bronchial asthma* with vaccines of the bacteria, to which they were sensitive. Seventy-five per cent. were relieved of asthma and 21 per cent. were improved. Seventy-five were treated with vaccines made from culturing their sputum on plain agar. The predominating organism was used. Forty-six per cent. were relieved and 16 per cent. improved. This type of treatment is still in the experimental stage. When a child is receiving active treatment, especially hypodermically, parents are liable to see improvement when none has occurred. I have noted this in using vaccines for pertussis. The parents were usually certain that improvement was coincidental with the first injection of vaccine.

Although infectious diseases are considered in another part of PROGRESSIVE MEDICINE, I am tempted to quote from an article on *pertussis* in the *Weekly Bulletin of the New York Department of Health*, November 6, 1920: "From January 1, to October 1, 1920, 6602 cases of whooping-cough were reported to the New York City Department of Health. From January 1, to October 1, 1919, 827 cases were reported. This means that there have been practically eight times as many cases

<sup>17</sup> Hay Fever in Children, Medical Record, July, 1919, xevi, 97.

<sup>18</sup> Bronchial Asthma in Children, New York Medical Journal, March 22, 1919, cix, 503.

recorded this year as last year. Thus far, 550 deaths have been reported, almost as many as the sum total of cases reported last year.

"The mortality from whooping-cough ranks second only to that from diphtheria among the contagious diseases. Of the total deaths from whooping-cough 95 per cent. to 97 per cent. occur under five years of age.

"We have still to find a cure for whooping-cough. The only remedies we know, at present, are palliative, and these are not very efficacious. Our hope lies in the discovery of a specific vaccine or serum.

"In regard to *serum*, none of practical value has been offered to date. In regard to the vaccine in use, present claims offer conflicting evidence. Research investigators are rather inclined to doubt peculiar therapeutic value of any variety of vaccine given after a disease has already developed. They are more inclined to believe that whatever good is obtained is not specific but due to reaction to protein shock. The clinical evidence collected by the New York Department of Health in 1916, in its whooping-cough clinics, did not show convincing proof of its value in the dosage given. Although the department still prepares and dispenses pertussis vaccine, it will not urge its use for treatment until its therapeutic value is definitely established."

Vaccine for the cure of whooping-cough is extensively used in New York City; in the experience of many, myself included, it has no value. I have not used it during the last three years. It is my belief that physicians put aside their better judgment when using vaccines for pertussis in an effort to please their patients who have learned of it from various sources and demand its use. I venture to guess that the vaccine treatment for pertussis will run its race in the next few years, perhaps dying a natural death in the advent of a new "specific."

Boughton<sup>19</sup> describes the death, following the injection of one minim of horse serum intravenously, of an adult twenty-nine years of age who had had *horse asthma* for ten years. A number of other similar cases are collected, but the point of paramount interest to the pediatricist is the fact, which is frequently introduced in literature, that sudden death may follow the use of diphtheria antitoxin in a patient who has had horse asthma. Boughton quotes Walker, I. C., who analyzed 150 cases of asthma and found 20 per cent. due to horse protein. Four per cent. of the 150 were sensitive to horse serum. The author suggests, and rightly so, that a diphtheria antitoxin be available which is made from serum from an animal other than the horse. He urges the cutaneous tests with diluted horse serum in those asthmatics who require antitoxin.

Ramirez<sup>20</sup> suggests the necessity of questioning donors for blood transfusion regarding various *anaphylactic manifestations*. His patient underwent blood transfusion of 600 c.c. He had never had asthma, hay fever, bronchitis, urticaria, angioneurotic edema or any other condition indicating hypersensitiveness to a foreign protein. Two weeks

<sup>19</sup> Anaphylactic Death in Asthmatis, Journal of the American Association, December 27, 1919, lxxiii, 26.

<sup>20</sup> Horse Asthma following Blood Transfusion, Journal of the American Medical Association, September 27, 1919, p. 73.



following the transfusion, during a ride behind a horse, he was seized with a violent attack of asthma. Ramirez obtained a positive skin reaction to horse dandruff reacting as high as 1-20,000. The donor had been a long-standing sufferer from asthma and bronchitis and reacted to 1-50,000 dilution.

Edlavitch<sup>21</sup> reports a case which developed a generalized urticaria following the ingestion of a teaspoonful of a tonic containing  $\frac{1}{4}$  grain quinine. The skin of the patient was scarified and 10 per cent. aqueous solution of quinine bisulphate was applied. A control was made within a few minutes; intense itching ensued followed by the appearance of an edematous papule surrounded by a bright reddish patch of erythema at the site of scarification. At the end of a few hours it had completely disappeared. Edlavitch remarks that this reaction can be obtained only in individuals who are hypersensitive to the drug, and can be obtained by using only quinine salts as the antigen.

The report of this case may be of considerable importance to those treating children in malarial districts. In very young infants with malaria, this cutaneous test might be used routinely before beginning quinine therapy. Malaria in children living in New York City is comparatively rare, in the last two years in a children's hospital with which I am connected, I can recall only 2 cases.

Baker<sup>22</sup> made an interesting and useful series of *comparisons between the incidence of sensitization in the normal child and the child showing anaphylactic symptoms*, as manifested in eczema, asthma and urticaria. It is to be hoped that more investigators will work along the same lines and when more definite data has been secured regarding positive skin tests in the normal child, we will be better able to interpret and correlate positive skin tests in those with symptoms.

Baker tested with all the vegetables, egg, milk, meat, grain, nut and fruit proteins and discovered that the proteins contained in the articles of diet giving a positive or questionable reaction in normal children were the ones which physicians commonly avoid in prescribing dietaries for children. He believes that the presence of sensitization in the absence of symptoms may be due to a low degree of sensitization not sufficient to cause anaphylactic manifestations. The foods commonly causing disturbance with anaphylactic symptoms were oatmeal, potato, egg, peas, rice, casein, beef juice and chicken.

**Premature Infants.** Schmitt<sup>23</sup> relates that among 8881 children born at Wurzburg Maternity Hospital in ten years, 316 children weighed only 700 to 2200 grams. Among these the mortality was 78 per cent. before the end of the first year. The smallest child who survived weighed 1100 grams at birth, but only exceptionally did any under 1500 grams survive. Of those weighing 1500 to 2000 grams, 25 per cent.

<sup>21</sup> Cutaneous Reaction to Quinine in Quinine Idiosyncrasy, Journal of the American Medical Association, December 27, 1919, lxxiii, 26.

<sup>22</sup> Incidence of Protein Sensitization in the Normal Child, American Journal of the Diseases of Children, February, 1920.

<sup>23</sup> Viability of Premature and Weakly Infants, Zeitschrift für Geburtshilfe und Gynäkologie, Stuttgart, May 31, 1919, lxxxi, 2; abstract, Journal of the American Medical Association, January 17, 1920, lxxiv, 3.

only reached twelve months of age. The author believes that with infants over 2000 grams the prospects are favorable for 50 per cent. surviving. Schmitt's belief that only 50 per cent. of premature infants weighing over 2000 grams (4.4 pounds) are likely to survive is, in my belief, putting the figures too low. With an available supply of breast milk the figures should be much higher, and even with artificial feeding, plus proper care, I should consider 50 per cent. too low a figure.

**Breast Milk.** Kappeller and Gottfried<sup>24</sup> state that, in the adulteration of breast milk, if as much as 20 per cent. of cows' milk or 10 per cent. of water has been added, the adulteration can be readily detected by the changes in the Umikoff reaction in the refraction of light and in the precipitation of casein. In the smaller community this may not excite much interest, but in the larger centers in which breast milk is brought to the hospitals and other agencies as a commercial product, it is extremely important.

**Frozen Milk.** Mixsell<sup>25</sup> has written an interesting review on frozen milk about which there is apparently a divergence of opinion. He quotes Kerley, who states that he has fed many thousand quarts of frozen milk, with no bad results. His summary, based on a review of some of the literature on frozen milk, is the following:

1. There is no increase in the number of bacteria in forty-eight hours.
2. After forty-eight hours the increase is marked, although the usual lactic acid forming organisms are not present in sufficient quantities to form a curd.
3. There is a rapid proteolysis which is pronounced at the end of two weeks.
4. The acidity is markedly increased, owing to bacterial action on lactose changing it to lactic acid.
5. No marked change in the fat has been noted except that caused by bacteria.
6. It is believed by many that frozen milk, if melted and thoroughly mixed, may be used without harmful effect within forty-eight hours after freezing.

**Chlorides in Breast Milk.** Sisson and Denis<sup>26</sup> note that certain infants, even when fed so-called rational mixtures, may develop intestinal disorders. The objective of the writers was to obtain evidence as to whether some of the more obscure nutritional disorders might be due to abnormalities in the mineral content of the food, assuming that an excess of inorganic salts might be as harmful as a deficiency. Their study considered only the chlorides, and, as a result of the examination of samples of milk taken from the first to the seventeenth month of lactation, it was found that after the first week, during which the figures were slightly higher, the average chloride content of breast milk varies but little, being about 50 mg. per 100 c.c. of milk. The authors found many mothers as low as 20 mg. per 100 c.c., and some as high as 110

<sup>24</sup> Adulteration of Human Milk, München. med. Wchnschr., July 9, 1920, lxxvii, 28; abstract, Journal of the American Medical Association, October 16, 1920, lxxv, 16.

<sup>25</sup> Frozen Milk, Archives of Pediatrics, May, 1920, xxxvii, 5.

<sup>26</sup> Observations on the Salt Content of Human Milk, Journal of the American Medical Association, August 28, 1920, lxxv, 9.

mg., while some showed a variation of 100 per cent. in from twenty-four to forty-eight hours. Their observations led them to believe that diet is not the essential factor in the variation in the chloride content of breast milk. They found that the milk of the phlegmatic types showed little variation in the chloride content while the woman of unstable type showed marked variation; the infants of these nervous types often develop diarrhea.

**Lactic Acid Milk.** Sherman and Lohmes<sup>27</sup> considered the question of fermentative action of the Bulgarian bacillus in lactic acid milk, which is generally considered efficient to inhibit the action of putrefactive organisms in the intestinal canal, and, in consequence, to lessen the absorption of their toxic products. According to many, the Bulgarian bacillus has no value in this direction.

The authors suggest that the lactic acid milk may increase the amplification of the waves of peristalsis, and will, through this increased relaxation and contraction, increase the function of the gastro-intestinal canal.

Their results with lactic acid milk were as good, if not better, than results with protein milk, although they do not specify in which type of case. They rightly consider the advantages in connection with the use of protein milk, *e. g.*, the high protein with its high calcium, the full fat, the low lactose, the low soluble salts, the fine curd during digestion and the concentrated food. In their method of mixing sour milk made from skimmed milk and whole milk, they state they have a combination relatively high in protein, full fat, the fine curd during digestion and a concentrated food.

They also advocate mixing barley water with lactic acid milk to make a smoother mixture. In the preparation of lactic acid milk they offer a few points worth remembering. Boiled milk is used entirely; when cultured, it is put away at a temperature of 85° F. in the child's ice box or fireless cooker and in the morning it will be found to have undergone a proper fermentation with an acidity of 70 to 90. To check fermentation, it is either put on ice or brought to a boil. If boiled, it should be actively stirred with an egg beater in order to keep the curds fine. The boiling leaves the fermenting Bulgarian Bacillus inert, the milk remains sour but sterile.

**Nutrition.** Holt<sup>28</sup> exhibited a number of charts showing the results of an attempt to estimate the total caloric needs of healthy children over one year of age. This total was determined by 4 factors, namely: (1) Basal requirements; (2) needs for growth; (3) needs for activity; (4) loss by excreta. The per kilo requirement diminished steadily from one year to the completion of growth. Growth needs were calculated from the rate of increase in height and weight for the different years. The loss by excreta at all ages was practically 10 per cent. of the calories taken. These three factors, though subject to individual variation with different children, were, as averages, uniform and irreducible. The only

<sup>27</sup> Lactic Acid Milk, Journal of the American Medical Association, October 2, 1920, lxxv, 14.

<sup>28</sup> The Food Requirements of Children after the First Year, Archives of Pediatrics, July, 1920, xxxvii, 7.



factor which differed greatly with different children was the need for activity. The child of average activity used up nearly one half his caloric intake in this manner; the very active child much more than this. The total caloric needs for the average child were greatest during the period of most active growth: in boys fifteen to seventeen years; in girls thirteen to fifteen years. At this period their needs exceeded those of adults with moderate activity in both sexes. The adolescent boy required 4000 calories daily. The average per kilo needs for boys was 100 at one year; this gradually fell to 80 at six years and was practically constant to sixteen years, when it gradually fell to the adult average at nineteen years. The tables are from the Child Health Organization, 520 Fifth Avenue, New York, and are printed on cards available to anyone for the asking. One should be in every physician's office.

HEIGHT AND WEIGHT TABLE FOR BOYS.

Height, inches.	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	35	36	37											
40	37	38	39											
41	39	40	41											
42	41	42	43	44										
43	43	44	45	46										
44	45	46	46	47										
45	47	47	48	48	49									
46	48	49	50	50	51									
47	..	51	52	52	53	54								
48	..	53	54	55	55	56	57							
49	..	55	56	57	58	58	59							
50	..	..	58	59	60	60	61	62						
51	..	..	60	61	62	63	64	65						
52	..	..	62	63	64	65	67	68						
53	..	..	..	66	67	68	69	70	71					
54	..	..	..	69	70	71	72	73	74					
55	..	..	..	..	73	74	75	76	77	78				
56	..	..	..	..	77	78	79	80	81	82				
57	..	..	..	..	..	81	82	83	84	85	86			
58	..	..	..	..	..	84	85	86	87	88	90	91		
59	..	..	..	..	..	87	88	89	90	92	94	96	97	
60	..	..	..	..	..	91	92	93	94	97	99	101	102	
61	..	..	..	..	..	..	95	97	99	102	104	106	108	110
62	..	..	..	..	..	..	100	102	104	106	109	111	113	116
63	..	..	..	..	..	..	105	107	109	111	114	115	117	119
64	..	..	..	..	..	..	..	113	115	117	118	119	120	122
65	..	..	..	..	..	..	..	..	120	122	123	124	125	126
66	..	..	..	..	..	..	..	..	125	126	127	128	129	130
67	..	..	..	..	..	..	..	..	130	131	132	133	134	135
68	..	..	..	..	..	..	..	..	134	135	136	137	138	139
69	..	..	..	..	..	..	..	..	138	139	140	141	142	143
70	..	..	..	..	..	..	..	..	..	142	144	145	146	147
71	..	..	..	..	..	..	..	..	..	147	149	150	151	152
72	..	..	..	..	..	..	..	..	..	152	154	155	156	157
73	..	..	..	..	..	..	..	..	..	157	159	160	161	162
74	..	..	..	..	..	..	..	..	..	162	164	165	166	167
75	..	..	..	..	..	..	..	..	..	..	169	170	171	172
76	..	..	..	..	..	..	..	..	..	..	174	175	176	177

ABOUT WHAT A BOY SHOULD GAIN EACH MONTH.

Age.		Age.	
5 to 8	6 oz.	12 to 16	16 oz.
8 to 12	8 oz.	16 to 18	8 oz.

HEIGHT AND WEIGHT TABLE FOR GIRLS.

Height, inches.	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	34	35	36											
40	36	37	38											
41	38	39	40											
42	40	41	42	43										
43	42	42	43	44										
44	44	45	45	46										
45	46	47	47	48	49									
46	48	48	49	50	51									
47	..	49	50	51	52	53								
48	..	51	52	53	54	55	56							
49	..	53	54	55	56	57	58							
50	..	..	56	57	58	59	60	61						
51	..	..	59	60	61	62	63	64						
52	..	..	62	63	64	65	66	67						
53	..	..	..	66	67	68	68	69	70					
54	..	..	..	68	69	70	71	72	73					
55	..	..	..	..	72	73	74	75	76	77				
56	..	..	..	..	76	77	78	79	80	81				
57	..	..	..	..	..	81	82	83	84	85	86			
58	..	..	..	..	..	85	86	87	88	89	90	91		
59	..	..	..	..	..	89	90	91	93	94	95	96	98	
60	..	..	..	..	..	..	94	95	97	99	100	102	104	106
61	..	..	..	..	..	..	99	101	102	104	106	108	109	111
62	..	..	..	..	..	..	104	106	107	109	111	113	114	115
63	..	..	..	..	..	..	109	111	112	113	115	117	118	119
64	..	..	..	..	..	..	..	115	117	118	119	120	121	122
65	..	..	..	..	..	..	..	117	119	120	122	123	124	125
66	..	..	..	..	..	..	..	119	121	122	124	126	127	128
67	..	..	..	..	..	..	..	..	124	126	127	128	129	130
68	..	..	..	..	..	..	..	..	126	128	130	132	133	134
69	..	..	..	..	..	..	..	..	129	131	133	135	136	137
70	..	..	..	..	..	..	..	..	..	134	136	138	139	140
71	..	..	..	..	..	..	..	..	..	138	140	142	143	144
72	..	..	..	..	..	..	..	..	..	..	145	147	148	149

## ABOUT WHAT A GIRL SHOULD GAIN EACH MONTH.

Age.		Age.	
5 to 8	. . . . . 6 oz.	14 to 16	. . . . . 8 oz.
8 to 11	. . . . . 8 oz.	16 to 18	. . . . . 4 oz.
11 to 14	. . . . . 12 oz.		

Weights and measures should be taken without shoes and in only the usual indoor clothes.

\* Prepared by Dr. Thomas D. Wood.

Borrino's<sup>29</sup> study of 113 breast-fed infants who did not seem to thrive after the sixth month of age emphasizes the necessity for supplementary food for infants, as the breast milk, according to his statement, grows less nourishing in comparison with the increasing needs of the child. In his analysis of cases it was demonstrated that breast milk or cows' milk alone did not suffice for the needs of the child after the sixth month of life.

Borrino's experience is similar to that of many of the American pediatricists who give cereals at the sixth month, vegetables and egg-

<sup>29</sup> Physiologic Weaning, *Revista di Clinica Pediatrica*, July, 1920, xviii, 7; abstract, *Journal of American Medical Association*, October 16, 1920, lxxv, 16.

yolk by the seventh or eighth, and whole egg before the twelfth month. Children fed more liberally seem to be more active, walk earlier and have a better color.

Talbot and Brown<sup>30</sup> show a number of interesting photographs, with case histories of children who showed a very large abdomen and marked lordosis. Some of these had chronic constipation, others were regularly tired after slight muscular exertion, had dark circles about the eyes, etc. Some had frequent attacks of vomiting; one, abdominal pain. These children showed astonishing improvement after the faulty posture had been corrected with braces or a front and back abdominal pad. With the mechanical helps, exercises were planned to strengthen the muscles and get the child into better muscular tone. They considered it of prime importance to get the body properly lined up. In their summary they make mention that cases in which the faulty body mechanics had been corrected the patients had all shown a more speedy recovery than is seen in cases without this correction. In the pale, weak type of child with flat chest, protuberant abdomen and prominent buttocks we are prone to treat strictly along lines of diet correction and ignore the type of treatment outlined by Talbot and Brown. This treatment seems reasonable and is deserving of a thorough trial. A simple but snug abdominal binder, if properly applied, will give the child with the thin, flaccid, abdominal walls much comfort, and incidentally, by helping body posture, will tend to correct constipation if the diet furnishes sufficient bulk.

Chapin<sup>31</sup> suggests that too much stress is placed on the caloric value of certain articles of food in making up a dietary, and that the physician is getting the habit of being satisfied with his arrangement of food if the caloric value is mathematically correct. He suggests that the calory feeding of theory be restricted or partially abandoned, and that as a substitute the physiologic properties of the various food elements be given the first role, and, furthermore, that some form of biologic testing of foods must be elaborated if a fair gauge of nutrition is to be established.

My personal belief is that the physician who knows the caloric values is the man who will use these figures as a check rather than a guide, and that the man who does not possess this knowledge is the one who will make the gross errors in selecting a dietary for either infant or adult.

Stheeman<sup>32</sup> is chief of the Children's Hospital at Gravenhage, and his long and extensive experience has convinced him that a large number of pathologic conditions have the one feature in common of an inadequate reserve of calcium. This calcium inadequacy, the author believes, is the underlying cause responsible for spasmophilia, for the habitus asthenicus, and allied conditions. He thinks that this fact has not been sufficiently appreciated in the past, due to the lack of

<sup>30</sup> Bodily Mechanics, American Journal of the Diseases of Children, September, 1920, xx, 3.

<sup>31</sup> Do Calories Measure the Value of Food? Journal of the American Medical Association, December 27, 1919, lxxiii, 26.

<sup>32</sup> Signs of Calcium Deficit, Nederl. Tijdschr. v. Geneesk, May 27, 1920, vol. xiii; abstract, Journal of the American Medical Association, July 3, 1920, lxxv, 1.



a simple and reliable test for the calcium content of the bloods. He suggests that the De Waard method of microtitration with  $\frac{1}{100}$  normal solution of potassium permanganate gives reliable findings with as little as 0.5 to 1 c.c. of blood or serum. His findings in the blood serum of 58 healthy children showed the calcium content to be constantly between 12 and 13 mg. per 100 c.c. of serum. In sick children it ranged between 8.25 and 17 mg. The age did not seem to influence the calcium content, but he found an extremely low figure in his so-called rachitic cases. The calcium content rose as the child improved. All his cases were benefited by cod-liver oil with phosphorus.

Cod-liver oil is not used in infants and children as frequently as it should be. That it has a definite value in promoting the retention of calcium there can be little doubt. It is one of our best aids in treatment of rickets and tetany. It has its uses with infants who do not tolerate butter fats. These will frequently tolerate cod-liver oil when the former causes vomiting and diarrhea. In undernourished children it has a definite place. The mistake most commonly made is endeavoring to give too much at each dose. A wise policy is to give small doses over long periods. Very few children will tolerate more than 3 drams per day, and in infants it is best to begin with 10- to 20-drop doses and gradually increase.

Adolph and Kaing<sup>33</sup> have reviewed the history and uses of the soy bean and showed its important relationship to the Chinese dietary. Soy bean curd is rich in protein and contains mineral substances necessary for growth. They give analyses of soy bean curd, bean milk and by-products obtained in their manufacture.

Soy beans should have a definite place in the dietary of the American child, particularly when it is desirable to replace the animal proteins with an easily obtainable, cheap vegetable protein.

An editorial (in the *Journal of the American Medical Association*, July 10, 1920, lxxv, 2) states the following: "The student has been taught that the starch grains must be ruptured and their contents 'liberated' to ensure good amylolytic digestion. The membranes enveloping the starch grains have been regarded as relatively impervious to digestive juices and the enzymes which they contain; hence the importance of cooking starch to render it readily digestible. It has been reported, in harmony with this point of view, that no starch appears in the feces after a meal of well-cooked wheat or rye bread, rice or potatoes, or even legumes prepared in the form of purée. It appears from recent investigations conducted in the office of Home Economics of the United States Department of Agriculture that current statements categorically claiming that starch in the "raw" state is to man an almost indigestible substance must be revised. Langworthy and Deuel have fed to men fairly large quantities of raw starches in the form of frozen puddings resembling ice-cream in taste and texture. The starch granules were neither swollen nor broken, yet ingested quantities exceeding 200 gm.

<sup>33</sup> Clinical Medical Journal, May, 1920, xxxiv, 3; abstract, Journal of the American Medical Association, August 7, 1920, lxxv, 6.

a day disappeared from the gastro-intestinal tract. Raw corn and wheat starches were found to be completely assimilated and no trace of them could be found in the feces. Experiments on raw potato gave values for its digestibility varying from 62.3 to 95.2 per cent.; the average was 78 per cent. The digestibility of the other constituents of the diet was not affected to any great extent by the large amounts of raw starch ingested. Why the ingestion of potato starch caused disagreeable physiologic disturbances not noted in the other experiments with raw corn and wheat starches remains to be ascertained. Whatever the explanation of this undoubted capacity for the utilization of at least some uncooked starches in the digestive tract of man may be, the newly demonstrated facts place the potency of the alimentary apparatus of man in a new and favorable light."

I have observed on one occasion in an out-patient service a young infant who, through a mistake, was taking as much as 50 grams of raw starch per day in the form of barley flour and thrived well on this addition to his deitary. Uncooked barley or wheat flour has its uses in the feeding of infants in certain selected cases.

**Malnutrition.** Mixsell<sup>34</sup> reports results in 12 cases of malnutrition fed with *thick food*; these infants had done badly on other formulæ. His stock mixture was 1 tablespoonful of farina to every 7 ounces of a 1 per cent. milk, with the addition of 3 per cent. cane sugar. The material was cooked thirty minutes until the food was of the consistency of jelly. The advantage of the thick food lies in the fact that the infant who can, and does, vomit fluids, has great difficulty in vomiting a food of jelly-like consistency. While not a panacea for any type of malnutrition, thick mixtures of milk and cereal are certainly indicated in rumination, and may be used to advantage in certain types of vomiting.

Mattill, Mayer and Sauer<sup>35</sup> found that atrophic infants have a considerably greater tolerance for *glucose* than normal infants; also, that the tolerance of a normal infant is approximately equal to that of adults. The glucose was injected by an apparatus permitting a continuous intravenous injection of solutions at any desired rate. The initial rate chosen was just below the tolerance of normal adults, and was injected for thirty minutes. If the urine later tested contained no sugar, the rate was increased. In normal infants the tolerance was found to be 0.8 to 0.9 gm. per kilogram of body weight per hour. In atrophic infants the tolerance was found to be 1.4 or 1.5 to 1.8 gm. per kilogram of body weight per hour. The reasons suggested for the higher tolerance in atrophic infants were (1) that the metabolism of atrophic infants proceeds at a higher rate than that of normal infants; (2) atrophic infants have a higher surface temperature than normal infants; (3) there is an increased insensible respiration.

In a study of the *effect of sodium cacodylate on atrophic infants*, Clark

<sup>34</sup> Thick Cereal Feeding in Twelve Cases of Malnutrition in Infancy with Report of Two Typical Cases, Archives of Pediatrics, August, 1919.

<sup>35</sup> Dextrose Tolerance in Atrophic Infants, American Journal of the Diseases of Children, January, 1920, xix, 1.

and Dow<sup>36</sup> selected 6 institutional infants, all under weight. Each child was given eight injections of sodium cacodylate, a maximum of 1 grain being given at each dose. The authors concluded that the sodium cacodylate had no toxic influence; this observation is of value. Their conclusions regarding increase of hemoglobin and weight need not be taken too seriously, chiefly because the number of cases studied is too small upon which to base conclusions, also because the more frequent handling and more intensive nursing incident to a study of this nature among institutional infants may be sufficient to account for a weight gain and possibly for an increase in the hemoglobin.

**Convulsions.** Mileo<sup>37</sup> cites a case of convulsions in a child, aged two months, with strabismus, bradycardia, exaggerated reflexes, fever and vomiting, all suggesting tuberculous meningitis. The spinal fluid was normal and prompt recovery ensued after a twenty-four-hour period of starvation.

This case is cited because of the frequency of convulsions in infants and the frequent difficulty of establishing a cause for the same. In his case the spinal canal was evidently promptly punctured and meningitis as a cause eliminated. Spinal puncture, in skilful hands, I believe, is without danger, especially in infants. I have never seen a meningeal infection ever attributed to a contamination from spinal puncture, nor have I ever seen a needle broken in entering the spinal canal of an infant or child. In a hospital out-patient service with which I am connected, tetany is probably the most frequent cause of the convulsions seen among infants. This same statement would not hold good for hospitals in the South or on the Pacific Coast. It is not my intention to go into the causes and symptoms of meningitis, but, in passing, something may be said which cannot be said too often—an infant taken suddenly ill with vomiting, fever, bulging fontanelle and exaggerated reflexes, with or without convulsions and change in the pulse-rate, should be suspected of having meningitis until proved otherwise, a spinal puncture is frequently the only way of excluding the possibility of a meningeal infection. Convulsions occurring at frequent intervals without febrile reaction are too frequently attributed to epilepsy. It may be an easy way out of a difficulty, but one must be bold indeed to make a definite diagnosis of idiopathic epilepsy before a child is at least two years of age.

**Measurements of Intestine.** Robbin<sup>38</sup> found the length of the large intestine in young children between 80 and 100 per cent. of the length of the body. The length of the small intestine was found to be between 500 and 900 per cent. of the length of the body. There was no association of any clinical condition with the unusually short or long small intestine.

<sup>36</sup> Results of Some Experimental Work with Sodium Cacodylate on Atrophic Infants, *American Journal of the Diseases of Children*, April, 1920, xix, 4.

<sup>37</sup> Convulsions from Alimentary Poisoning, *Pediatrics*, Naples; abstract, *Journal of the American Medical Association*, October 16, 1920, lxxv, 16.

<sup>38</sup> Length of Large and Small Intestine in Young Children, *American Journal of the Diseases of Children*, May, 1920, xix, 5.



**Glandular Therapy.** Apert<sup>39</sup> thinks there should be a fertile field in pediatrics for glands besides thyroid in cretinism. He advocates the use of suprarenal cortex to stimulate the nutritional processes. With uniform backward growth he has obtained good results, with a combination of thyroid and suprarenal powder. These results have been noted in the frail and anemic types. He finds indication for pituitary treatment in the short, hairy subjects with precocious puberty; for suprarenal treatment among the overtall, weak and apathetic, and among boys with a tendency to feminine characteristics.

The indications for the use of the various glands of internal secretion, with the exception of the thyroid for hypothyroidism, are far from definite. Various observers from time to time report quite remarkable results from organotherapy, but in the experience of many, myself included, organotherapy is very disappointing. Treatment is more or less experimental in every case, but if these glandular substances are used cautiously, harm is not liable to result.

**Malnutrition Studies.** Emerson and Manny<sup>40</sup> have made a valuable contribution to literature on malnutrition. It is to be regretted that space will not permit the introduction of their tables relating to weight and height in growing children. These tables should be placed in every physician's office. The following résumé of their summary may convey a glimpse of the content: (1) Malnutrition is a definite clinical entity with a characteristic history, definite symptoms and pathologic physical signs; (2) clinical evidence shows that the physical sign which may best serve to identify this group of malnourished children is the relationship existing between the weight and height; (3) the age factor is of secondary importance and is mainly serviceable in selecting cases stunted by constitutional disabilities, such as syphilis, tuberculosis, deficient thyroid, the effect of certain drugs, convalescence from long illnesses, etc.; (4) individual variation in the relationship of height to weight is of sufficient importance to make it necessary to use a zone system rather than any single line as a basis of reference.

Reference is made to Holt's report of 700 observations made on boys ranging from nine to sixteen years of age in a New York private school. This showed the period from May to November to have a decided advantage over the other months in both weight and height increase. The result is ascribed to the greater freedom from illness and more outdoor life.

Brown<sup>41</sup> conducted an interesting study in experimental health work on malnourished children in a public school in Kansas City, Missouri. The particular school was selected because it showed the highest percentage of children who were more than 10 per cent. underweight. Most of the children were of American parents. The 112 children were

<sup>39</sup> Organotherapy for Children, *Presse médicale*, Paris, May 29, 1920, xxviii, 35.

<sup>40</sup> Weight and Height in Relation to Malnutrition, *Archives of Pediatrics*, August, 1920, xxxvii, 8.

<sup>41</sup> A Study of Malnutrition of School Children, *Journal of the American Medical Association*, July 3, 1920, lxxv, 1.

weighed every two weeks, demonstrations were given at home and the mothers urgently requested to coöperate. Mid-morning and mid-afternoon nourishment was given, 1000 to 2000 calories on the principle of "protective feeding as outlined by McCollum, that is, one to two pints of milk with cereal and fruit every day, the balance is made up in soup, vegetables and sandwiches and occasionally milk chocolate and cookies. Clinical service was secured for A. and T. operations, dental work, etc. It is not necessary to go into detail to explain results. The group of 112 children gained 278 per cent., or 50 ounces each, during the observation period, as contrasted with 18 ounces gain of normal children during the same period.

In summary, the author says that a careful study of the results forces the conclusion that the two factors chiefly responsible for the interesting showing are the work of the nurse in securing home coöperation and the selection of food with reference to supplying the dietary deficiencies of the home on the "protective feeding" plan.

It was noted that these children cheerfully stowed away from 1000 to 1800 calories in addition to their customary three meals. The mothers reported that they were eating more at home also. It is probable that the amount of food needed by growing children has been underestimated. These children, in spite of adverse conditions and handicaps unremoved, were so desperately in need of food that they made a gain of 278 per cent. (normal gain 100 per cent.), or 302 per cent. over the control group.

I am in sympathy with the statement that "the amount of food needed by growing children has been underestimated." If one were to look into the mess hall of one of our good boarding schools or at West Point or Annapolis at the meal hour, one could not but be impressed with the amount of food eaten by growing boys of sixteen to twenty years, when the intake is limited only by the capacity of the individual. I am told that 4000 to 5000 calories per day is not unusual.

Rich<sup>42</sup> quotes a report of the Employment Certificate Bureau of the Chicago Public Schools showing that 53 per cent. of the children of fourteen years of age applying for employment certificates were from 7 to 21 per cent. below the average child of that age. Many of the children could not carry a normal amount of work, became discouraged and lost their positions, some falling a prey to criminal companions.

The Board of Education believed that undernourishment was the cause of the failure of these children. They made it a standard that a child of fourteen, in order to obtain a working certificate, must be 57½ inches tall and weigh 80 pounds. A number of nutritional clinics were started; to obtain coöperation of parents, efforts were made to show them results and demonstrate the wage value of the child's gain and the consequent economic worth to them. Interesting progress was made in all the classes started and among other things it was noted that when children made substantial gain in weight they gained appreciably in height. Every community in the country should face this problem of

<sup>42</sup> Study of Malnutrition and Mental Development in Childhood, *Journal of the American Medical Association*, July 24, 1920, lxxv, 4.

undernourishment and make efforts to take stock of its growing children. Nutritional classes which have been in operation in Boston, New York and Chicago during the last few years have demonstrated the definite benefit of nutritional clinics and the great number of children in need of such class coöperation.

Chapin<sup>43</sup> is the father of a system known in New York as the *Speedwell System* which has done much for the malnourished infant who is neither an institutional nor a hospital problem. He has developed what may be called a unit system of intensive boarding out. The unit is a neighborhood which has been carefully surveyed for good homes. The infants are boarded out in these homes and are under the constant supervision of a visiting nurse and physician. The infants are kept by the foster mothers until favorable progress has been made for a considerable period. In these units the foster mothers become trained in the intelligent care of infants. In comparing the results obtained with the average or even the best type of institutional care, one is struck with the superiority of the boarding out system to the institutional. The Speedwell has thus far developed three units but hopes to extend its work.

Too much praise cannot be given to Henry D. Chapin who has done so much to foster the idea that hospitals and institutions should keep an infant under observation but a minimum number of days. Pediatricists are only beginning to appreciate that we are keeping infants too long in our hospitals. Shorter periods in hospital with longer periods of observation in good dispensaries plus careful follow-up work should be our aim. If we can supplement this with a unit system for boarding out certain infants, as developed by Chapin, we should have better results when the year's work is checked up.

Data presented by Larson<sup>44</sup> from an Orphans' Cottage Home in Rochester, N. Y., showed the effect on the weight of 10 children resulting from substitution of oleomargarine for butter during a six months period and the effect during the following six months when administration of butter was resumed. The weights presented cover a period of two and a half years. There was a gain in weight for each six months except the period when oleomargarine was used when 9 of the 10 children lost weight. One of the children called physically supernormal did not lose weight, but her gain, as compared with the other periods, was retarded. The graph for the total weight of 7 children whose records were complete for the two and a half years shows, at the end of 1916, a total weight of 477½ pounds. Six months later the total weight was 501¼. Twelve months after the first recorded weights the total was 545½ pounds, but at the end of the next six months' period, which was the oleo period, the total weight of the group was 536 pounds, recording a loss of 9½ pounds. At this point oleomargarine was omitted and butter resumed, and after six months of butter-feeding the group weighed 592 pounds, a gain of

<sup>43</sup> Problems of Boarding Out with an Attempted Solution, Medical Record, New York, April 17, 1920, xevii, 16; abstract, Journal of the American Medical Association, May 22, 1920, lxxiv, 21.

<sup>44</sup> Butter Fat and the Child's Weight, presented at the Section of Pediatrics, New York Academy of Medicine, December 11, 1919.



56 pounds. During this period the children not only gained rapidly in weight but made up the loss noted during the previous six months during which oleo was given.

This is a useful contribution to our knowledge of the comparative value of certain fats in increasing the weight of children. There may have been other factors which influenced the weight loss during the period in which oleomargarine was substituted for butter.

Morse<sup>45</sup> presents definite ideas for the *feeding of infants during the second year*. He states that whether an infant has been nursed or fed artificially, it should not be having at the end of the first year any food other than milk with or without a cereal diluent, orange-juice, some of the simple cereals and possibly broth and beef juice. Any other foods he considers contra-indicated. He condemns the giving of eggs until the eighteenth month. Meat and green vegetables he would not allow until the beginning of the third year and would prefer the use of vegetables about the thirtieth month. He comments unfavorably on the custom of some pediatricists who give meat and eggs at a year and on those who feed children more liberally at two than he does at four or five years.

McLean<sup>46</sup> states that certain normal infants will not tolerate a more liberal diet than that outlined by Morse, but in his opinion the average infant will thrive better upon a more liberal diet. He noted that infants fed a more liberal diet were stronger, more active, walked earlier, their fontanelle closed earlier and they had a better color and musculature. In his opinion pediatricists are prone to judge the results of feeding entirely by the weight curve and are liable to allow their better judgment to be warped because of this.

McLean begins orange-juice at the third month, one teaspoonful daily with a weekly increase of one teaspoonful until the child is having the juice of an entire orange. The liberal use of orange-juice minimizes the necessity for laxatives and adds to the dietary one of the richest sources of antiscorbutic vitamine.

In this writer's opinion the average artificially-fed infant thrives better after the sixth month with at least part of his caloric needs supplied by other food than milk, of which not more than 28 ounces is given at any time. McLean's objection is based chiefly on the low iron content in cow's milk and to the large amount of bulk in milk that is necessary to give the infant sufficient calories. He commences cereal, fed with a spoon, at the fifth month, the pulverized yolk of a hard-boiled egg at the sixth month, and steamed puréed vegetables, such as spinach, by the seventh month. He further states that closure of the anterior fontanelle at eighteen months is considered the normal average, but in infants fed a varied liberal diet it is noted that the fontanelle in a majority of instances closes between the tenth and fourteenth months. Delayed closure of the fontanelle is a manifestation of rickets. If the fontanelle closes earlier in a normal child fed a varied diet is it not fair

<sup>45</sup> The Feeding of Normal Infants during the Second Year, Journal of the American Medical Association, February 28, 1920.

<sup>46</sup> The Feeding of Normal Infants, Medical Record, New York, November 6, 1920, xcviii, 19,

inference that closure at eighteen months is a delayed closure and possibly a rachitic manifestation. The author's diet for a normal child of one year is here included:

TABLE I.—DIET FOR CHILD OF ONE YEAR.

Age, 1 year. Weight, 22 pounds—10 kilos.

Article.	Amount.	Grams of			Calories as			
		Fat.	C-H.	Pr.	Fat.	C-H.	Pr.	Total.
Milk . . . . .	24 oz.	..	..	..	235	142	103	480
Cereal . . . . .	3 oz.	..	..	..	5	42	8	55
Egg . . . . .	1	..	..	..	57	0	18	75
Potato . . . . .	1 oz.	..	..	..	0	28	4	32
Soup . . . . .	4 oz.	..	..	..	9	12	52	73
Rice . . . . .	1 oz.	..	..	..	0	30	4	34
Butter . . . . .	1 tsp.	..	..	..	37	0	0	37
Stewed fruit . . . . .	2 oz.	..	..	..	2	74	3	79
Vegetables . . . . .	1 oz.	..	..	..	1	11	3	15
Total . . . . .	..	37	83	48	346	339	195	880
Per kilo . . . . .	..	3.7	8.3	4.8	34	34	20	88
Per pound . . . . .	..	1.7	3.8	2.2	16	16	9	41
Percentage of calories as . . . . .	..	..	..	..	39	39	22	

**Vitamines.** Many studies adding to the knowledge of the vitamins have been published in the last twelve months. It is to be regretted that most of these studies have been made on the smaller animals. Growth conditions in rats are not strictly analogous to growth conditions in infants, nor do the wiser investigators make such claims. What is needed at the present moment is a correlation of results obtained by many investigators and further clinical studies in the application of these findings.

Mendel,<sup>47</sup> in a paper read before the New York State Medical Society on experiments with the "Fat-soluble Vitamine" in rats, found vitamins particularly high in butter, egg yolk and oils of certain vegetables. In the young rat  $\frac{1}{4}$  gm. of butter fat per day will allow normal growth and  $\frac{1}{10}$  gm. in older rats will prevent malnutrition. One-tenth gm. of spinach or  $\frac{1}{10}$  gm. of dry tomato has the same effect. He found the color-bearing vegetables higher in vitamins than white vegetables. Dry steam for two and a half hours does not effect vitamins in butter fat.

Osborne,<sup>48</sup> in a paper read before the same society on the "Water-soluble Vitamine," noted that vitamins stimulate appetite in rats and their withdrawal has converse effects. In order to increase the bulk of intake, the vitamine intake must be previously increased. In refining cane sugar and milling flour, almost all the vitamins are removed.

An editorial<sup>49</sup> discussess the food restrictions placed on the Danish

<sup>47</sup> Fat-soluble Vitamine, read before the Medical Society of the State of New York, May 24, 1920.

<sup>48</sup> Water-soluble Vitamine, read before the Medical Society of the State of New York.

<sup>49</sup> Editorial, Journal of the American Medical Association, March 13, 1920, lxxiv, 11.

people during the later years of the war which indirectly resulted in great shortage of dairy products and fats from animal meats. This placed the country on a preponderatingly vegetarian basis, with consequential lowering of the protein content in the dietary and a deficit in the fat intake. To correct the protein deficit the cereals were subjected to only a slight milling, thus retaining a maximum of the outer nitrogenous layers which are commonly removed. Wheat bran was added to flour to increase the protein content of the bread made from it. The absence of symptoms of malnutrition commonly associated with the absence of fats was attributed to the presence of fat-soluble vitamin A in many of the vegetables used by the Danish people in quantity.

Hart, Shenbock and Ellis<sup>50</sup> produced evidence favoring the fact that concentration of antiscorbutic vitamin in milk is dependent on the diet. Summer pasture milk being richer in antiscorbutic vitamins than dry-fed milk and milk from cows fed on corn, silage or sugar mangels, 15 c.c. daily of summer pasture milk, plus the basal requirement protected one guinea-pig for twenty weeks against scurvy.

In 9 out of a series of 10 guinea-pigs fed by Faber<sup>51</sup> on a diet of oats, water and honey, severe scurvy developed in from four to six weeks. It is therefore possible that honey has no antiscorbutic vitamin.

Hess<sup>52</sup> recommends the juice of canned tomato as a better antiscorbutic than orange-juice. While it is true that the juice of the tomato, either canned or raw, is cheaper than orange-juice, in my experience this difference in cost is the sole advantage of the former over the latter. It has been noted by me, in a limited number of cases, to be sure, that approximately double the amount of tomato juice has to be used in cases of scurvy to effect a cure as compared with the amount of orange-juice needed. In using 3 to 5 ounces of tomato juice daily in cases of scurvy (which is the amount generally necessary in severe cases) loose stools are liable to result. In this country tomato juice probably has its greatest field in large child-caring institutions where a daily dose of antiscorbutic is given to every infant. Economy then would be a real factor.

Dulcher, Pierson and Biester<sup>53</sup> found, in experiments on guinea-pigs fed diets of oats, water and milk, that scurvy developed and the animals consequently died. Water extracts of lean beef were added to the diet, but scurvy developed in the same length of time as without beef extracts. When orange-juice was added scurvy did not develop. The authors showed conclusively that the poor condition of the animals on the beef extract diet was due to the absence of the antiscorbutic vitamin.

<sup>50</sup> Influence on Diet of Antiscorbutic Potency of Milk, *Journal of Biologic Chemistry*, July, 1920, xlii, 3.

<sup>51</sup> Antiscorbutic Value of Honey, *Journal of Biologic Chemistry*, August, 1920, xliii, 1; abstract, *Journal of the American Medical Association*, October 2, 1920, lxxv, 14.

<sup>52</sup> Antiscorbutic Vitamin in Canned Tomato, *New York State Journal of Medicine*, July, 1920, xx, 7; abstract, *Journal of the American Medical Association*, August 21, 1920, lxxv, 8.

<sup>53</sup> Antiscorbutic Properties of Raw Beef, *Journal of Biological Chemistry*, Baltimore, June, 1920, xlii, 2; abstract, *Journal of the American Medical Association*, July 31, 1920, lxxv, 5.



In a case of infantile scurvy, Newell<sup>54</sup> explains early findings and those of one week later. In the first the diagnosis was based on the line of decreased density in the lower portion of the right femur, with increased density distal to it. There was no evidence of hemorrhage. In the plates taken one week later there were enormous subperiosteal effusions extending the entire length of the shafts of both femurs. The hemorrhage had stopped abruptly at the line of absorption. He attributes this phenomenon to the fact that the periosteum in childhood is loosely attached to the shaft of the bone but firmly attached to the epiphyseal line; consequently the hemorrhages raise the periosteum very easily on the shaft but meet with a barrier at the epiphyseal line.

Basset-Smith<sup>55</sup> describes the preparation of lozenges from lemon-juice used in the British navy for the prevention of scurvy. The tablets, which contain the equivalent of 24 c.c. of unfiltered juice, had been stored at varying degrees of temperature for months. Orange- and lemon-juice apparently does not lose any of its antiscorbutic properties when dehydrated and treated with sugar. Cases of scurvy have been seen by me which recovered promptly on dried orange-juice which had been kept for some months. This dried orange-juice was produced by one of the companies which makes dry milk and is now on the market.

**Pyelitis.** Lozana and Ruiz<sup>56</sup> give details of 25 cases of pyelitis, all but 5 in girls. The colon bacillus alone was found in 25 per cent. and was associated with other organisms in 33 per cent. There was no mortality in their 25 cases except in 3 tuberculous children, whom, I presume, had multiple tuberculous abscesses of kidney.

The term pyelitis has been constantly loosely applied to cover a group of symptoms in female infants with temperature predominating and with either gross or microscopic pus in urine. By pyelitis we naturally assume a gross inflammation of the pelvis of the kidney, yet in infants dying of some other condition who have had pus in the urine one is confused by the fact that gross examination of the kidney frequently reveals nothing abnormal. It would seem that the term pyuria were better unless cystoscopy revealed a lesion of the pelvis. The great majority of children with pyuria promptly improve on the administration of large quantities of fluid which apparently is as beneficial as either the alkali or the hexamethylenamin treatment. One should be cautious about a favorable prognosis, especially in young infants, as congenital cystic kidney may give the same symptoms, and, if both kidneys are affected, has regularly a fatal outcome. Stone in the kidney is not uncommon in children, and when the pus has persisted for more than three weeks an x-ray of the kidneys is indicated.

Kretschmer and Helmholz<sup>57</sup> present an interesting paper on the

<sup>54</sup> Case of Infantile Scurvy, *American Journal of Roentgenology*, August, 1920, vii, 8; abstract, *Journal of the American Medical Association*, October 16, 1920, lxxv, 16.

<sup>55</sup> Prophylaxis in British Navy, *Lancet*, London, May 22, 1920.

<sup>56</sup> Suppuration in the Urinary Passages of Children, *Archivos Españoles de Pediatría*, Madrid, July, 1919, iii, 7; abstract, *Journal of the American Medical Association*, November 29, 1919, lxxiii, 22.

<sup>57</sup> The Treatment of Pyelitis in Infancy, *Journal of the American Medical Association*, November 13, 1920, lxxv, 20.

*treatment of pyelitis by pelvic lavage* with 0.5 per cent. silver nitrate. They claim that, with the small cystoscopes now in use, cystoscopy can be performed in infants as easily as in adults, and that even male infants can be cystoscoped. They comment on the value of routine x-ray in all cases of pyuria, as in this way the question of stone in the pelvis is eliminated. Several of their pyuria cases were found to have stones. I have known of 2 such cases recently among colleagues in which the presence of stone was demonstrated by x-ray although previously unsuspected.

In the series of 11 cases the youngest was seven months and the oldest ten and a half years. There were no untoward results or reactions following instrumentation and treatment. No cases were considered cured unless the urine was rendered sterile and free from pus. In 9 of the 11 cases, complete cures were obtained. The number of injections required to render the urine sterile varied: 3 patients required but one injection, 5 required two injections and 1 patient required three injections. In 2 cases the kidney urines were sterile before the bladder urine, in 1 case after two injections and in the other after the first injection. In 10 of the 11 cases the colon bacillus was found in pure culture; 1 case had a paratyphoid bacillus infection. In all of the cases the pyelitis was bilateral, and it is important to know that in not one of the cases was a colon cystitis present.

The authors state in their summary only that "all of the cases treated this way had resisted all other forms of treatment." Cases of "pyelitis" almost regularly recover, some, however, become chronic and have pyuria for years, frequently with sterile urine. Administration of a general anesthetic and pelvic lavage with silver nitrate during the acute stage of "pyelitis" would naturally be contra-indicated. For the chronic case we have had no treatment in the past. This study by Kretschmer and Helmholz is a valuable contribution and may offer a cure for this type of case, the treatment of which in the past has been so disappointing.

Rhonheimer<sup>58</sup> collected facts regarding the later life of 122 cases of pyelonephritis of infancy. In his cases there were urinary changes for upward of a year, when the child was apparently normal. In examination from one to eight years later there were no urinary changes, with no recurrences. In older children it was different, frequent recurrences giving credence to the belief of the obstetrician that pyelitis of pregnancy is a flare-up of an old pyelitis of childhood.

He reviews Birk's well-known case of pyelitis at nine years of age, severe recurrence at eleven, pregnancy at eighteen, with a normal urine. In the author's 122 cases, 23 per cent. were boys.

Bókay<sup>59</sup> reports 2 cases of female infants five and a half and six months old, both with large amounts of pus in urine but in which the cerebral symptoms were very marked. The first case had rigidity of the neck, high fever, increased knee-jerks, extreme restlessness and

<sup>58</sup> Effects of Pyelitis in Infancy on Kidneys in Later Life, Corresp. Blatt. f. Schweiz. Aerzte, Basel, p. 1929.

<sup>59</sup> Celurie-Symptome bei Pyelo-Cystitis des Säuglingsalters, Jahrbuch f. Kinderheilk., 1918, lxxxvii, 181-186.

frequent vomiting. Lumbar punctures brought fluid under great pressure but water-clear; following puncture, symptoms were relieved. Five days later a second puncture showed water-clear fluid, with entire relief of symptoms.

The second patient had similar symptoms, plus bulging fontanelle. The author advocates in "pyelocystitis" of infants with meningeal symptoms, lumbar puncture for therapeutic reasons. It is not infrequent to note meningeal symptoms in cases of "pyelitis;" these symptoms often dominate the clinical picture, and not until a specimen of urine is obtained and gross pus noted does the situation become clear.

Magoun<sup>60</sup> has performed valuable experiments bearing on the question, "Can organisms pass from the pelvis of the kidney into the blood stream?" He injected cultures of *Bacillus prodigiosus* into the ureter of dogs, which were killed at the end of two to three hours. In the first experiment the culture was allowed to flow into the ureter 2 to 4 cm. below the pelvis of the kidney. In 12 experiments the invading organism was found in the blood stream, or other organs in 3 instances, and was found in the other kidney in all but 2 of the experiments.

Houda<sup>61</sup> found that after the infusion of alcohol into the vein of a rabbit an acute inflammation of the Malpighian bodies develops. Infusions given over long long periods from time to time caused a chronic inflammation which eventually caused atrophy.

Moran<sup>62</sup> reports operation on both kidneys at the same time to remove multiple calculi causing anuria. The child, aged four years, afterward shows normal development, but the urine is turbid and contains "formed elements and bacteria."

**Dehydration.** The *effects of introduction of fluids* in the case of dehydrated infants were studied by McLean and Lang.<sup>63</sup> Only infants showing signs of dehydration were given treatment. Seventy-six infants received 269 injections of fluid. Of these, 155 were hypodermoclyses, 92 were intraperitoneal injections and 22 were sinus injections. The amount of the clyses varied between 90 and 150 c.c., depending on the size and condition of the child. The following solutions were used: 6 per cent. dextrose in physiologic sodium chloride solution, 2 per cent. sodium bicarbonate with 1 per cent. dextrose solution. Among the special effects were the following: The pulse is more frequently affected after sinus and intraperitoneal injections than after hypodermoclyses. The respiratory rate is more frequently affected in the peritoneal injections than in sinus injections and hypodermoclyses. The temperature is more frequently elevated in sinus injections than in intraperitoneal injections or hypodermoclyses. Weight gains are more frequently

<sup>60</sup> Pelvis of Kidney as a Possible Source for Infection of Blood Stream. Preliminary Report, Journal of the American Medical Association, January 10, 1920, lxxiv, 2.

<sup>61</sup> Pathologic Changes in Kidneys Due to Intravenous Injection of Alcohol, Japan Medical World, Tokyo, October 26, 1919; abstract, Journal of the American Medical Association.

<sup>62</sup> Calculi in Both Kidneys of Girl of Five, Jour. d'urol., Paris, January, 1920, viii, 6; abstract, Journal of the American Medical Association, April 10, 1920, lxxiv, 15.

<sup>63</sup> Fluid Injection in Dehydrated Infants, American Journal of the Diseases of Children, May, 1920, xix, 5.



noted following the intraperitoneal injections than after sinus injections or clyses. Certain infants show no improvement until after repeated injections. The shorter the interval between the onset of symptoms and the beginning of treatment, the greater the response. The average practitioner does not appreciate the great need of the acutely ill infant for fluids. Certain dehydrated infants will not take fluids by mouth. In these, fluids must be given by another route. In intestinal conditions, with loose stools, the "Murphy drip" is of little value for as fast as the water is given by rectum it is expelled. Hypodermoclysis is a simple procedure and should be more often used at the bedside. The peritoneal route has certain advantages: it is quicker and more fluid can be injected at one time than by clysis. Of the sinus route, I shall speak later.

Goldbloom<sup>64</sup> describes an improved model of his previously—described instrument for introducing a needle into the longitudinal sinus of infants. It consists of a needle 4 cm. long, with an obturator which fitted into an aluminum block 3 cm. in thickness, thereby allowing 1 cm. of the needle to project. In the old model the block was rectangular, but in the new one the block is bevelled at an angle of 50 degrees, with the point directed toward the occiput. This minimizes the risk of injuring the wall of the sinus or the cortex. By means of a set-screw the needle is made adjustable to any desired length up to 1 cm. This instrument is an invaluable adjunct to those who have been converted to the practicability of using the longitudinal sinus for introducing the various types of fluids for therapeutic purposes. I do not feel that it should be used for the withdrawal of blood for diagnostic purposes. It is my opinion after an observation of a great many punctures of the longitudinal sinus that it has a limited use for a limited number of experts who have had previous experience on the cadaver. For obtaining blood for routine Wassermann tests in infants, puncture of the sinus is not justified, as blood can always be obtained in other ways. For the introduction of salvarsan or neosalvarsan, it has no place. In certain instances for transfusion of blood or the introduction of various fluids in dehydrated infants in definite need of treatment it is a justifiable procedure, always assuming that entrance to other veins is not possible.

Aikman<sup>65</sup> reviews different methods of injecting fluids, mouth, rectum, hypodermoclysis, intravenously, intraspinally and intraperitoneally. In infants with open fontanelle he believes the method of choice is by the longitudinal sinus, although he makes no mention of the needle devised by Goldbloom. He gives details of a case which was given fluids by the peritoneal route, and believes that results in his cases have been most satisfactory.

Tallermann<sup>66</sup> by analysis of the blood discovered an increased amount of blood-sugar following injection of glucose by the rectum. One part of glucose to 2 parts of normal saline was injected, 180 c.c. at a time. The

<sup>64</sup> An Improved Needle for Sinus Therapy, *American Journal of the Diseases of Children*, March, 1920, xix, 3.

<sup>65</sup> Methods of Administering Saline and Other Solutions to Infants and Children; Report, *Journal of the American Medical Association*, January 24, 1920, lxxiv, 4.

<sup>66</sup> Rectal Absorption of Glucose, *Quarterly Journal of Medicine*, July 20, 1920, xiii, 52.

injection covered a period of ten minutes. In all but 2 cases the glucose in solution was well retained and no ill-effects were noted. This method might be useful in children with certain athreptic conditions, and possibly following some abdominal operations where it is advisable to omit mouth-feeding for long periods.

**Intestinal Parasites.** Waite and Neilson<sup>67</sup> report the *effects of hookworm disease* on the mental development of North Queensland school-children. During 1918 the State of Queensland, Australia, the Australian Institute of Tropical Medicine and the International Health Board conducted jointly a hookworm survey in the northern part of Queensland. Through stool microscopy they found 21 per cent. of the total population to be infected. The parasite was harbored by 40 per cent. of the school-children, a great many of whom showed physical dwarfing and sexual retardation. They divided their positive cases into heavily infected and lightly infected groups; the former were those who showed ova in the plain smear examination and the latter those who showed ova only in the centrifuged specimen.

Three hundred and forty children were given a mental examination by the 1911 Goddard revision of the Binet Simon scale and the Porten's mazes. The examiner was not informed of the results of the stool examination. The results have been summarized by the authors: (1) Hookworm disease in North Queensland children produces measurable mental sluggishness; (2) hookworm disease in North Queensland children retards their mental development in proportion to the massiveness of the infection; (3) prolonged hookworm infection appears to produce cumulative mental retardation.

An analogy of results in Australia might be found in some of our Southern states. That "public health is a purchasable commodity" is becoming known among our urban population, but our rurals in many states still tend to be suspicious of those who would change their present mode of life.

McLean,<sup>68</sup> in an examination of over 300 stools collected at random from an out-patient department in New York City and examined for ova by the Kafoid Barber method, noted that only 2.27 per cent. harbored parasites. The summary is as follows: (1) In an examination of 308 stools in children up to twelve years of age, 2.27 per cent. harbored parasites; (2) there were 3.7 per cent. positive in 189 examinations of children from two to twelve years of age; (3) in a group of 69 children from four to twelve years of age, 5.7 per cent. were positive. This probably represents the average percentage of infection of children in private practice in New York City.

Brosius and Bishop<sup>69</sup> state that the hemoglobin, after treatment for intestinal parasites, improves very rapidly in young children and less

<sup>67</sup> Effects of Hookworm Disease on Mental Development of North Queensland School Children, *Journal of the American Medical Association*, December 20, 1919, lxxiii, 25.

<sup>68</sup> Infrequency of Intestinal Parasites in Young Children, *Journal of the American Medical Association*, June 26, 1920, lxxiv, 26.

<sup>69</sup> Diseases Due to Intestinal Parasites in Colombia, *Journal of the American Medical Association*, June 26, 1920, lxxiv, 26.

rapidly in young adults. They found it not uncommon to raise the hemoglobin in children from 40 to 60 per cent. in two to three months after careful treatment.

Clossot<sup>70</sup> found 9 *pin-worms* in a healthy appendix removed on account of symptoms of grave acute appendicitis in a girl aged seventeen years. In the author's review of literature he finds that parasites are not found in the diseased appendix, but only when normal conditions prevail, but they may induce symptoms resembling those of an acute inflammatory process. He quotes Riff who found oxyurids in 75 per cent. of 63 cases of supposed appendicitis in children. In 2 cases in the same family developing symptoms he directed his efforts against the parasites, with prompt recovery.

Loeper<sup>71</sup> found, in treating patients for gastric and duodenal ulcer with bismuth carbonate, that the drug completely freed them from pin-worms which had resisted all previous measures. Since then he has used this treatment and found that in four to five days the parasite and ova disappear from the stools. He gives children aged seven years 4 grams and under seven years 2 or 3 grams. Sometimes a second or third dose may be necessary.

Like the cures for whooping-cough, there is a new drug for the cure of pin-worms appearing almost every year. Let us hope that bismuth carbonate may be of use. It is a fairly simple matter to rid the lower portion of the large intestine of pin-worms; those situated higher up about the cecum are difficult to dislodge. Perhaps injections for the dislodgment of the parasites below combined with bismuth carbonate to reach those above might be effectual.

**Calcium Content of the Blood.** An editorial in the *Journal of the American Medical Association* of October 2, 1920, on the calcium content of blood, states that "the element calcium has acquired a position of importance among the inorganic components of the body and its problematic role has grown to considerable significance with the development of modern physiology. The various functions that have been ascribed to calcium cannot be summarized here in detail. Aside from its obvious relation to the growth of the tissues, particularly the bones, the element is known to be involved in the clotting of the blood and of milk, and in the maintenance of the physiologic equilibrium that makes the blood an ideal circulating medium and nutrition for the heart, in the preservation of a normal permeability of the bloodvessels and in maintaining a normal irritability of the various parts of the nervous system.

"In view of these facts and hypotheses—for some of the items cited can scarcely be designated as indisputable facts—one naturally inquires how calcium is transported in the organism. Recently, Kramer and Howland, of the Johns Hopkins University, have demonstrated anew that the concentration of calcium in the serum of normal adults is singularly constant, so that even small diviations are regarded as diagnostic

<sup>70</sup> Helminths and Appendicitis, Rev. méd. de la Suisse romande; abstract, Journal of the American Medical Association, September 18, 1920, lxxv, 12.

<sup>71</sup> Cure of Oxyuriasis with Bismuth Carbonate, Progrès méd., August 7, 1920, xxxv, 32; abstract, Journal of the American Medical Association, September 25, 1920, lxxv, 13.



of disorder. For instance, whereas human blood serum exhibits a content of 9 or 10 mg. per 100 c.c., the serum of infants suffering from tetany may exhibit a decrease in calcium amounting to more than 50 per cent.

"A second problem concerns the possibility of altering the calcium content of the blood. Considerable evidence might be cited to show that the feeding of diets, rich or deficient, respectively, in calcium makes no appreciable difference in the amount of this element found in the blood, bones or other tissues. Feeding a calcium-rich diet to animals had no effect on the calcium content of their blood. These findings with respect to the blood, however, do not justify the assumption that in the long run variations in the intake of calcium are without moment to the body."

Two articles on the *calcium metabolism of infants* have been published by Holt, Courtney and Fales.<sup>72</sup> In the first of these were presented results of observations on 30 healthy infants, 23 rachitic infants and 19 infants suffering from diarrhea. The observations showed that healthy infants taking modifications of cow's milk should have an intake of CaO of at least 0.19 gram per kilo of body weight in order to retain sufficient CaO for normal growth. To ensure proper absorption of this calcium, the amount of fat in the diet should be ample, at least 4 grams per kilo; thus in a balanced diet there should be approximately 0.05 gram of CaO for each gram of fat. An excess calcium intake does not increase the absorption. About 45 per cent. of the calcium intake is absorbed. The remainder is excreted in the feces partly as calcium phosphate and partly as calcium soaps. No constant relation was found between calcium excretion in the stools and either the fat intake or fat excretion. Contrary to prevalent opinion it was found that the calcium absorption was best when the stools were formed and soapy. Such stools usually occurred when the intake of calcium was ample. Accordingly, excellent absorption was found in these cases even though the calcium excretion in the stools was large. The calcium excreted in combination with fat, as soap, was never found to be more than three-tenths of the calcium intake.

Rachitic children were found to have a much lowered absorption of calcium, the excretion in the stools being greater than normal. Infants recovering from rickets had calcium absorption greater than normal: Infants suffering from diarrhea had very low calcium absorption.

The second paper discussed the results of 79 observations on healthy children from one to eight years of age, 18 rachitic children and 20 children with chronic intestinal indigestion. These observations showed that children over one year of age require less calcium intake per kilo body weight than do infants. These children absorbed a sufficient amount of CaO (average 0.055 gram per kilo), when the intake of CaO was over 0.09 gram per kilo. When the intake of CaO was less than 0.09 gram per kilo the absorption was less than the need of the body for normal growth. It was found that these older children needed a fat intake of more than 3 grams per kilo to ensure proper absorption of

<sup>72</sup> American Journal of the Diseases of Children, February, 1920, xix, 97; March, 1920, xix, 21.

calcium. About 40 per cent. of an adequate intake (over 0.09 gram per kilo) was absorbed. When the intake of calcium was less than 0.09 per kilo, on the average only 20 per cent. was absorbed, since the excretion tends to remain constant. As with the infants, no constant relation was found between the excretion of calcium and either the intake or excretion of fat and the calcium loss as soap was never a significant part of the intake. The intake of calcium apparently affected the reaction of the stools, since in almost every instance when the calcium intake was low the stools were acid.

It was found that the substitution of vegetable fat for milk fat in the diet of the children did not affect the calcium metabolism in any way. The administration of cod-liver oil in addition to a diet containing ample calcium regularly increased the absorption of calcium. If additional calcium was supplied in the diet in the form of chalk mixture (calcium carbonate) the absorption is increased considerably above the normal, but if given as calcium acetate or calcium phosphate the absorption is not increased.

Like the rachitic infants it was found that older children with rickets had a lowered absorption of calcium and that during recovery the absorption rose above the normal. The children with chronic intestinal indigestion had a very much lowered absorption of calcium, since the loss of calcium in the very large stools typical of this condition was much greater than normal. Absorption nearly normal was found in this condition when both the fat and calcium intake were unusually high.

Pritchard<sup>73</sup> assumes that practically all types of malnutrition occurring during infancy and early childhood tend to terminate in rickets. He believes the poverty of calcium in the bones is due to calcium requirements elsewhere in the body which temporarily are more urgent. This urgent need is probably the requirement of calcium to neutralize an existing acidosis. He further argues that all chronic conditions of malnutrition terminate in acidosis and that all claims on alkaline bases arising in connection with the neutralization of the acidosis must be satisfied before those of growing bone. This is a most ingenious theory.

Howland and Park<sup>74</sup> gave a lantern-slide demonstration showing alterations at the junction of the shaft and cartilage in rickets as determined by the *x*-ray. It was demonstrated that the calcium deposits cast definite shadows. The results of the cod-liver oil administration was demonstrated by serial *x*-ray plates, and in animals a beginning calcium deposit was demonstrated two days after beginning cod-liver oil. In infants, the calcium deposit was demonstrated at the end of three weeks.

It would be equally important to know whether cotton seed oil and various nut oils which are now used so extensively in the dietaries of children would be as efficient in stimulating deposit of calcium in the bony tissues.

<sup>73</sup> Causation and Treatment of Rickets, *British Medical Journal*, November 15, 1919, p. 627.

<sup>74</sup> Some Observations on Rickets, Thirty-second Annual Meeting of American Pediatric Society.

Jacobowitz<sup>75</sup> determined the calcium content of the blood by the micro method in 21 children without signs of tetany and in others with tetany, and found it decidedly lower in the latter group. No influence on the calcium level in the blood was noted on administration of calcium by mouth either in tetany cases or in those free from tetany.

These observations are in keeping with those of Kramer and Howland previously noted. In spite of the fact that the calcium level of the blood is not raised on the administration of calcium by the mouth, it is perhaps our best therapeutic agent in the treatment of tetany. Forty to 60 grains of calcium chloride per day is well tolerated by infants and generally has a definite effect in clearing up the symptoms.

McLean<sup>76</sup> reports 47 cases of tetany from an out-patient department seen during a period of eighteen months. Of these 47, 12 were admitted during the early part of 1917, and 24 during the same period of 1918. The author suggests that the unusual number observed was connected with the close confinement of infants indoors on account of the severity of the winter of 1918.

**Syphilis.** Although syphilis will be considered in detail in the September issue of *PROGRESSIVE MEDICINE*, some new observations relating to secondary syphilis in infants and children have been abstracted here, in the belief that the treatment of congenital syphilis is in the domain of the pediatricist rather than the dermatologist. The nutritional factor in the luetic infant is important; the feeding of many presents so difficult a problem that it can only be handled by the experienced pediatricist. He should be qualified to direct the specific therapy, as the dermatologist concerns himself but little with the feeding problem of infants. Jeans has written a very useful review on syphilis in childhood which will repay a careful reading.<sup>77</sup> In an article<sup>78</sup> of his own he has observed marked changes in the cerebrospinal fluid, including a plus Wassermann in practically one-third of 214 infants and children with hereditary syphilis. Of those with pathologic cerebrospinal fluid, one-third of the infants and two-thirds of the older children had clinical evidence of nervous involvement. Jeans has observed 7 cases in ages ranging from three months to four and a half years, with syphilitic involvement of the meninges and definite signs of meningitis. He states that it must be a more common condition than the scattered case reports would lead one to believe. In 25 children having clinical evidence of neurosyphilis 12 had associated gross mental defects.

Jeans and Cooke,<sup>79</sup> in a study of the incidence of hereditary syphilis, included the histologic examination of a series of placentas, together with a Wassermann reaction on the fetal blood from the umbilical cord at birth. In many cases follow-up Wassermans were obtained from

<sup>75</sup> Calcium Content of Blood in Tetany, *Jahrbuch f. Kinderheilk.*, 1920, p. 92; abstract, *Journal of the American Medical Association*, October 16, 1920, lxxv, 16.

<sup>76</sup> Seasonal Incidence of Tetany. A Report of 47 Cases, *Archives of Pediatrics*, February, 1920, xxxvii, 2.

<sup>77</sup> *American Journal of Diseases of Children*, August, 1920, xx, 2.

<sup>78</sup> Syphilis of the Central Nervous System, *American Journal of Diseases of Children*, September, 1919, xviii, 3.

<sup>79</sup> A Study of the Incidence of Hereditary Syphilis, *Archives of Pediatrics*, July, 1920, xxxvii, 7.



the mother and infant after two months. There was a high percentage of agreement between results of Wassermann on the maternal blood and histologic evidence of syphilis in the placenta. Postmortem findings in the stillborn also correspond with the placental history. In an examination of 129 infants two months of age or older, 10 per cent. presented definite evidence of syphilis, the remainder, 90 per cent., presented no evidence. The histologic examination of the placenta for syphilitic changes corresponded to a diagnosis of syphilis in 95.5 per cent. of the cases. In every instance in which the placenta was noted as showing luetic changes, the infant was found later to have syphilis. In the above-mentioned group in which the diagnosis was definite, the Wassermann on the placental cord blood corresponded to the diagnosis in the infant in 96.5 per cent. In every instance in which the fetal blood gave a positive reaction the infant was later found to have syphilis. In some instances noted in other groups in which the infant had syphilis, the maternal Wassermann alone was positive, in others the placenta alone.

A résumé of their very important contributions is as follows: When syphilitic changes were present in the placenta the infant was syphilitic even though the Wassermann reaction was negative on the fetal blood, and *vice versa*, the infant had syphilis if the cord blood showed a positive Wassermann even though the placenta appeared normal. The infant might be syphilitic if both placenta and cord were negative. A syphilitic child might be born to a woman with a negative Wassermann, and a mother with untreated syphilis and a strongly positive Wassermann reaction might have a healthy child.

Ramsey and Groebner<sup>80</sup> noted that the *dosage of mercurial preparation in congenital syphilis* was still a haphazard affair. They found that the amount of mercury eliminated in the urine during a given time would give a fair index of the amount in the circulation. The urine examination followed treatment by inunction by mouth and by hypodermic injection. When only one dose was given by any of these methods, mercury continued to be eliminated in the urine for a variable time, and in 1 case as long as ten days.

They observed that when 50 per cent. mercurial ointments were used the elimination began soon after administration, the maximum occurring during the first three days, and was fairly complete within five days. With 33½ per cent. ointment the elimination was slower, not beginning until the second day, and in much less quantity. When the ointment was smeared on the skin the amount eliminated was much less than when the ointment was rubbed in. With the use of hypodermic salicylate of mercury the maximum elimination was within the first twenty-four hours; smaller quantities continued to be eliminated for six or seven days. Calomel and gray powder by mouth were apparently not absorbed to a great extent.

<sup>80</sup> Further Progress in the Study of the Relative Different Mercurial Preparations in the Treatment of Congenital Syphilis in Infants and Children as Determined by a Quantitative Analysis of the Mercury Eliminated in the Urine, Thirty-second Annual Meeting of the American Pediatric Society.

Stokes and Busman<sup>81</sup> have made an interesting observation in that they have attributed chills, rise of fever, nausea, vomiting, headache and sweating following arsphenamin intravenous injection to the use of new rubber tubing. They have found that a certain type of new rubber tubing contains, when new, a toxic agent responsible for a definite type of reaction. This toxic substance gradually disappears from the tubing on repeated use. The toxic substance is apparently removable by soaking the tubing for six hours in normal sodium hydroxide solution and rinsing. This toxic substance is not destroyed by boiling and is not apparently associated with the mechanically removable debris from the inner surface of the tube.

Wright,<sup>82</sup> in an article on administration of arsphenamin by rectum, believes that the arsenic is picked up by bloodvessels and lymphatics of the rectum and sigmoid and the greater proportion of the solution conveyed directly to the liver. He believes that much more arsphenamin enters the liver and is stored there by this method than by the intravenous method. His procedure consists in starvation of the patient for a twenty-hour period and dehydration by means of salts and cathartic pills. Just before the enteroclysis is given, atropine and morphine are administered. His indications for rectal administration of salvarsan or neosalvarsan are as follows:

1. Fat infants with small or no visible superficial veins.
2. Scrawny patients with poor veins.
3. Children.

This is not a new method. Jeans quotes Azemar<sup>83</sup> who stated that an aqueous solution of neoarsphenamin is rapidly absorbed by the rectum and in the second hour is present in the urine in preponderable amounts. The amount increases in the urine up to the third day and is usually absent from the urine by the sixth day. Compared to intravenous injection the elimination is slower and the therapeutic effect less prompt, less thorough, less constant and less permanent.

I am not at present prepared to state whether the rectal route is practical in infants and whether it is comparable to the intravenous route. That the technic presents serious difficulties in infants there is no doubt. Many succeed in expelling the solution even when the buttocks are tightly strapped. In infants having frequent stools it is certainly contra-indicated. In infants of more than six months of age it may be practical.

Fordyce and Rosen,<sup>84</sup> in a preliminary report, offer a *new method for the treatment of congenital syphilis*. These authors quite correctly state that no definite working plan has been formulated for treating secondary syphilis in infants with the precision and regularity employed in adults.

<sup>81</sup> Tubing as a Cause of Reaction to Intravenous Injection, Especially of Arsphenamin, Journal of the American Medical Association, April 10, 1920, lxxiv, 15.

<sup>82</sup> Administration of Arsphenamin by Rectum in Form of Enteroclysis, New York Medical Journal, August 28, 1920; abstract, Journal of the American Medical Association, September 11, 1920, lxxv, 11.

<sup>83</sup> Ann. de Dermat. and Syph., September, 1918, vii, 14.

<sup>84</sup> A Method of Treating Congenital Syphilis, Journal of the American Medical Association, November 20, 1920, lxxv, 21.

In a certain percentage of fairly well-nourished infants, involution of the cutaneous manifestations took place with improvement of the health, but there was little or no change in the serology following the old-fashioned method of inunction and internal administration of mercury. Fordyce and Rosen discuss the technical difficulties in connection with injection of the arsenical preparations into the longitudinal sinus, the veins of the arm, scalp or neck or intramuscularly into the gluteal region.

The method of procedure followed by the writers includes the use of both neoarsphenamin and mercury intramuscularly, with a special needle to ensure the proper location of the drugs in the gluteal muscles.

The mercurial employed is the mercuric chloride put up in palmitin in individual collapsible ampules in doses of from  $\frac{1}{10}$  to  $\frac{1}{8}$  grain, or larger for older children. Their object in giving a soluble mercury in oil was to favor slow absorption of the drug. This would allow larger amounts at each injection and long intervals between injections. They use an ordinary mercury needle from 19 to 20 gauge cut down to from one-half to one inch in length. The injection is given into the muscle about one inch from the intergluteal fold near its upper angle. Six to 8 treatments of mercuric chloride at weekly intervals is the present treatment followed by a rest period of from four to six weeks.

The neoarsphenamin is put up in individual glass ampules containing 0.1 to 0.2 gm. and large enough to hold 5 c.c. of solution, the object being to dissolve the drug in the original container. From 2.5 to 3 c.c. of cool, freshly distilled water is used; one-half of the solution is injected into each buttock. Fordyce and Rosen find that abscesses and infiltrations can be avoided if the drug is injected deep into the muscle. To prevent leakage into the subcutaneous and adipose tissue, they have devised a special needle from one-half to one inch in length (somewhat longer for older children), of 19 to 20 gauge, with an oval concave shoulder which fits snugly over the buttock, the shank of the needle being inserted flush with the under surface of the concavity. This holds the needle firmly in place during movement of the infant. The authors are giving neoarsphenamin in the following doses at weekly intervals:

0.075 gm.	for infants 3 to 8 weeks of age.
0.1 gm.	for infants 2 to 6 months of age.
0.15 gm.	for infants 6 to 12 months of age.
0.15 to 0.2 gm.	for infants 12 to 24 months of age.

To date, 45 infants were so treated, and they have had no bad results. They have found that blood taken from the umbilical cord at birth may have a Wassermann strongly positive, while ten days later blood taken from a vein of the infant may give a negative result. In controlling their cases they have made several tests at ten-day intervals, and, if they continued negative in the absence of a clinical evidence of the disease, they follow the child serologically for a year, lengthening the interval to from four to eight weeks. They note that the blood is sometimes negative in the presence of the clinical infection or it may fluctuate from



negative to positive at different times. Part of their summary reads as follows:

1. The earlier treatment is begun the better are the chances of cure.
2. Systematic treatment with soluble mercury in oil and neoarsphenamin given intramuscularly is so simple and the results so gratifying that serologic cures may be anticipated within one year of interrupted treatment.
3. The Wassermann test taken at birth in the infant is not to be relied upon. Ten days after birth is a better time for interpretation of the serology.
4. A negative Wassermann test in the face of positive clinical manifestations may occur in congenital syphilis, therefore careful clinical examination is very important and antisyphilitic treatment may be instituted with negative serology.

Few articles have appeared during the past year from an authoritative source which have as important a message to the pediatricist and the general practitioner. A simple method for the treatment of congenital syphilis is offered which is available to every practitioner. We have waited a long time for such a procedure; sponsored by one of our most trusted syphilographers it will undoubtedly have widespread use.

Müller and Singer<sup>85</sup> review their experience in an asylum for inherited syphilis. They give data of 214 children, 84 of whom were under surveillance for two, four, nine and ten years. Their results show that the most serious effects of congenital syphilis may be attenuated or even completely cured. The total mortality among 202 cases was 22.8 per cent. Their mortality would probably have been less had the children not been interned for such long periods in an institution.

**Nervous System.** Hunt<sup>86</sup> reports a case of *juvenile paresis* in a boy aged twelve years. Physically, he showed unequal pupils, irregular and immobile, a tremulous tongue and a coarse tremor involving the entire body. The speech was hesitating and ataxic, and he was paralyzed below the waist. There was loss of control of both sphincters. Up to the age of nine he had been able to attend school; from that age he went slowly down hill. A brother of the patient, aged fourteen years, had a positive Wassermann, as well as another brother, aged ten years, and a sister, aged four years, and the mother. The father refused examination.

Pardee<sup>87</sup> reports 2 cases of *Mongolian idiocy* in the same family. There were 11 children living in the family, and the mongols were the two youngest. The other children were bright and intelligent, the oldest being twenty-seven years of age. He comments on the rarity of 2 Mongols in one family, and quotes Goddard, who reported 322 cases, and in not one instance was there more than one Mongolian in the same family. He also quotes Schlapp who, in an examination of 500 Mongolians, had never seen 2 in one family. Van der Scheer had collected instances of 3 in one family and 2 in another.

<sup>85</sup> Fate of Syphilitic Children, Arch. f. Kinderh., May 17, 1919.

<sup>86</sup> A Juvenile Paretic and His Family, reported in the Journal of the American Medical Association, November 8, 1919, lxxiii, 19.

<sup>87</sup> Two Cases of Mongolian Idiocy in the Same Family, Journal of the American Medical Association, January 10, 1920, lxxiv, 2.

Hollis and Pardee<sup>88</sup> surveyed the literature on *tuberculous meningitis* from 1910 and have discovered that there were 11 undoubted cases which ended in recovery, the criteria being the clinical course, the cell count and differential of the spinal fluid, the finding of tuberculous bacilli and the demonstration of the disease in an inoculated guinea-pig; as the authors correctly remark the last 2 are the real proof. They enumerate cases reported by other writers ending in recovery in which tubercle bacilli were not found in the spinal fluid.

They quote statistics of Holt, who had 100 per cent. mortality in the Babies' Hospital, From a large London hospital and from one in Vienna practically the same results were noted except in some indefinite cases.

In 93 cases under fifteen years of age in St. Luke's Hospital, New York, there were no recoveries, in 49 cases over fifteen years of age there were 4 recoveries, making a mortality in 142 cases of 99.2 per cent. The authors give details of their 2 undoubted and 2 doubtful cases which recovered, the former only which merit consideration.

One was a twenty-six-year-old adult with a former history of pleurisy who had been losing weight for three months prior to onset of disease. Tubercle bacilli were found in the spinal fluid in moderate numbers. The spinal fluid was clear, 95 to 100 per cent. lymphocytes in 4 examinations, with 126 to 441 cells, and globulin positive. Following withdrawal of spinal fluid, 20 c.c. of Flexner meningococcus serum was administered intraspinaly on three occasions. The patient was discharged cured after ten weeks' stay in the hospital.

The other patient was a woman, aged forty-seven years, in whose spinal fluid tubercle bacilli were found. She was treated by five injections of serum and cleared up. Inoculations of a guinea-pig showed tubercles in the spleen.

I have never seen a proved case of tuberculous meningitis in a child recover. The course, as a rule, is more rapid than in adults, and usually at autopsy the surface of the brain is studded with tubercles. There is rarely a tendency for the disease to localize itself. On the other hand, the history of these cases, one in a young adult, offers some encouragement to therapy in tuberculous meningitis in older children. The use of meningococcus serum does not appear logical, but Hollis and Pardee suggest that serum has two actions: (1) by adding to the spinal fluid certain antibodies which it is unable to develop itself, and (2) by the introduction within the dura of a foreign protein in the form of horse serum, the irritative effect of the latter producing a cellular response and a hyperemia about the site of any localized tubercle.

<sup>88</sup> Recovery from Tuberculous Meningitis after Treatment with Intraspinal Injections of Antimeningococcic Serum, Archives of Internal Medicine, July, 1920, xxvi, 1.

# RHINOLOGY, LARYNGOLOGY AND OTOTOLOGY.

By GEORGE M. COATES, M.D.

**Training of the Otolaryngologist.**—Previous to the beginning of the war in August, 1914, it had been the custom, for many years, for those practitioners of medicine who desired to specialize in diseases of the ear, nose and throat, to go to the great Teutonic Universities at Heidelberg, Berlin and Vienna, or, in much lesser numbers in recent years, to Paris or London. So prevalent had this custom become among Americans that it was thought that one could scarcely rate himself a specialist unless he had studied "abroad" if even for a few weeks only. The foreign Universities, particularly those in Berlin and Vienna, catered to this large and lucrative practice, giving the courses most in demand in English, working up courses on special subjects demanded by Americans and endeavoring in every way possible to maintain the prestige thus acquired.

The inevitable results were two-fold: In the first place, American work put forth was strongly tinged with German ideas and technic; and the German literature of the specialty was the most eagerly read, and the opinions therein set forth were given undue prominence over that of the rest of the world. The minds of the specialty were quite largely teutonized and nothing new was good unless bearing the mark "made in Germany." The second result was the lack of systematic high-grade postgraduate instruction in the United States, or for that matter in any of the countries who afterward became associated as the "allies." Postgraduate instruction, to be sure, was to be had in private courses in the big American cities, given by returned foreign students, or in the polyclinics and postgraduate schools. In these, the work was a labor of love to those of the profession engaged in teaching and the classes limited to those who, for lack of time or money, were compelled to stay at home and take what short and necessarily incomplete courses they could obtain. These courses came into more or less deserved disrepute from the contrast of the character of their work with that of the elaborately equipped foreign institutions with their wealth of clinical material and salaried instructors, and the term of "six weeks' specialist" was one of opprobrium often used in connection with their output.

The outbreak of war, in 1914, closed the doors of the German and Austrian clinics to American students, and the noted French and English teachers were soon too busy with home and army problems to care for alien pupils. In due course of time, it was realized that America must make use of her undoubted resources and train her own young men in the specialties of their choice, and efforts, more or less successful, were made to improve existing institutions by lengthening courses and



including more didactic teaching with the clinics; to broaden them by giving more hours in fundamental anatomy and physiology; and to include topics in borderline subjects that would help to round out the would-be specialist.

This work was shortly interrupted by our own entrance into the war and consequent mobilization of our specialists, old and young, for army service. Thereupon a difficulty arose: how to differentiate the real specialists with training and ability from those who merely called themselves so. Many of the latter were found in all branches of the profession and some poor work was done in otolaryngology. It was soon realized that something should be done to improve the efficiency of these partly or poorly trained men and much useful personal postgraduate instruction was given in the base hospitals in America where efficient chiefs of high standing in civil life were stationed. At the end of a year of war this idea had developed into the establishment of an army postgraduate medical school at Fort Oglethorpe where systematic didactic and clinical instruction was given in the various branches of medicine to officer-students. Each branch of the school was in charge of a director who was, in turn, supported by a corps of instructors chosen largely by himself from those in the service who had had experience in teaching in civil life. In this way much excellent work was done in the short life of the school.

The Department of Otolaryngology was under the able direction of Lieutenant-Colonel Thomas J. Harris,<sup>1</sup> whose report on the organization and development of the school is worthy of serious study by those interested in the subject of postgraduate instruction. It shows what can be accomplished, even in a short period of time, under conditions regulated by army discipline and where full-time, paid instructors are provided. In many respects this school compared favorably with university teaching since coöperation with other departments supplied teachers on subjects other than strictly laryngological or otological, as, for example, pathology and radiology. Coöperation was, moreover, obtained from the Surgeon-General's office in the matter of securing adequate and up-to-date equipment, and from the eminent teachers of otolaryngology of the country who placed at the disposal of the Director their valuable collections of wet and dry specimens, their lantern and microscopic slides, charts, etc.

Altogether 110 student-officers passed through the school, these having been selected after careful examination by the director or his representative, and representing only a portion of those who desired to take the course. On account of limited time, it was impossible to admit beginners, only those showing a real fitness being received, and these were not allowed to continue the course in case they proved to be incompetent.

The course was necessarily a short one, being planned to run from four to six weeks, but it was made as thorough as it could be in that time, and consumed a large part of each day. It consisted of lectures and practical work, observation of operations, ward walks and the perform-

<sup>1</sup> Transactions American Laryngological Association, 1919.

ance of operations by the pupil himself as he demonstrated his ability. Lectures were given by the Director and his assistants, and by the heads of other departments, as the School of Laboratories, School of Roentgenology, of Ophthalmology, etc. Much attention was given to the study of anatomy, which was taught with wet and dry specimens, upon the cadaver and with lantern slides. For practical work, the class was divided into sections of four or five, weekly quizzes were given and thorough examinations were compulsory at the end of the course, upon the result of which the student was rated.

At Camp Greenleaf a board of examiners met daily to examine every student-officer immediately on arrival, the director of each school quizzing those who claimed proficiency in his specialty and in this way opportunity was given to ascertain the qualifications of several hundred men from all parts of the country, who claimed to be otolaryngologists. Harris says that the results of these examinations were as astonishing as they were disappointing. Whether in the practice of the specialty for a few years, or many years, they all, with few exceptions, showed a woeful lack of knowledge of fundamentals. Inquiry showed that out of the entire number of those who presented themselves, very few had had more than a six weeks' course. "The all-important subject of anatomy was a closed book to them. Such a thing as physiology of the nose, throat and ear few had any realization of. As for pathology, bacteriology and neurosurgery, these did not enter within their field of knowledge. For most of them, the broad field of otolaryngology, with its many intricate side paths, meant only the ability to remove tonsils and straighten septa."

"This alarming lack of qualification on the part of the average otolaryngologist practising in the towns and cities of this country, as demonstrated by the results of these examinations, serves but to drive home with greater emphasis the need of comprehensive and adequate graduate instruction. So long as the six weeks' course is given to any and all who are prepared to pay the tuition, apart from whether proper qualifications are possessed or not, so long will our country continue to be at the mercy of ill-trained and uneducated specialists."

For several years past there had been special committees appointed by the several national societies of specialists, who have been working on the problem of standardized graduate instruction in otolaryngology. At the outbreak of the war the conclusion had been reached that only by the standardization of postgraduate instruction, an agreement between the leading class A schools of the country to accept the standard, and then, after satisfactory examination, to confer a special degree, could the incompetent and untrained self-styled specialist be done away with.

All this constitutes a serious indictment of our specialty but one that the trained observer will think is not perhaps overstated. General Munson<sup>2</sup> severely arraigned the profession at large for the results of the Greenleaf examination, and with the sudden termination of the war, releasing many teachers from the service, the work of improving condi-

<sup>2</sup> Quoted by Coakley, *Annals of Otology, Rhinology and Laryngology*, December, 1919.

tions was taken up with vigor. Sir St. Clair Thompson, on his visit to this country in June, 1919, detailed the English plans for giving instruction to foreign physicians seeking instruction, and in several of the leading medical centers of this country plans, begun earlier but held in abeyance during the war, were rushed to completion. A number of teachers have expressed their views on the requirements for a post-graduate course and in the main their views agree, the difference being mainly in the number of hours to be allotted to certain subjects and the designation of the specialist by degree or otherwise at the end of the course.

Shambaugh<sup>3</sup> feels that the profession has for years been flooded with six weeks' specialists who have only picked up the technic of a few operations during their courses and are incapable of making proper examinations and diagnoses. They have not been interested in learning the principals of otolaryngology, and few who took their courses either here or abroad have become contributors to the advancement of our specialty. While agreeing with him in the main, I think the criticism too harsh. Having been connected with postgraduate teaching for years, I have seen many earnest students in our courses who eagerly absorbed all we were prepared to give them. Many of these have since become men of note, not only in their communities, but in the medical life of the country, and have been worthy contributors to the programs of our national societies, and the pages of our magazines. Shambaugh believes, as do most of us, that the graduate work should be under university supervision and should lead to a higher degree, such as Ph.D. (in otology or laryngology). General principals must be taught before operative technic and at least a full year should be spent in preparing for practice. The work of this year should be as much in the study of the fundamental sciences of anatomy, embryology, physiology, and pathology, as in the clinical aspects of the subject. Reading should be directed, and the student should be taught to make diagnoses and to understand proper indications for operative treatment.

That this is considered by the leaders of the specialty a most important subject is evidenced from the fact that Coakley in his presidential address before the American Laryngological Association in 1919, Pierce, in a similar address in 1920, and Beck, in his chairman's address before the Otolaryngological Section of the American Medical Association in 1920, all made this the subject of their remarks. Coakley<sup>4</sup> quotes from the report of General Munson, referred to above, as follows: "One deduction is that the general reputation of the man is not necessarily a criterion of his actual qualifications; another, that in their estimates of each other gained by ordinary contact, physicians are not infallible; another, that a large number of men actually practising a specialty in this country, and generally accepted as such, are not duly qualified as the experts that they are supposed to be." The latter point is one of special interest and concern to those interested in postgraduate and specialty education in this country. General Munson also stated that 70 per cent. of the alleged otolaryngologists, after the establishment of

<sup>3</sup> Journal of the American Medical Association, April 10, 1920.

<sup>4</sup> Transactions of the American Laryngological Association, 1919.



the school at Fort Oglethorpe, were rejected. There are listed approximately 13,000 names in this country of those devoting themselves to this specialty, and if 70 per cent. of this number is incompetent, it means that there are in this country about 9000 so-called otolaryngologists whom the War Department would not consider competent to care for soldiers. They surely are no better fitted to care for the civil population. The principal reason for the incompetency of a large number of otolaryngologists seems to be the insufficient training received before the individual starts practising, and much of this is blamed upon the six weeks' courses of instruction. Coakley thinks that the graduate school must be endowed either by individuals or the state so that the schools will be in a position to accept or reject candidates who desire to pursue any kind of graduate course of instruction by determining in advance whether they are qualified to receive such instruction. They would thus also be able at any time during the course of instruction to drop registrants for inefficient medical progress. The teaching should be supervised by the leaders in the profession, but the bulk of the actual teaching must be performed by the young men who have not yet reached that stage of their career, where their private practice occupies every available part of their time and such an association with the university would prove highly attractive to the instructors and tend to bring the best young men to the university centers where the opportunity for research and study would be greater.

Pierce<sup>5</sup> says that the men coming to the Chicago clinics for instruction are often found to conceive the successful specialist to be one who is more or less perfected in three operations only: tonsillectomy, septum resections and turbinectomies. He quotes from the report of a committee composed of the heads of departments in otolaryngology of three of the Universities in Chicago to consider the question of postgraduate teaching. The present system of instruction in these departments in the postgraduate medical schools in this country is inadequate and inefficient for various reasons, among which is the fact that these schools lack the essential organization, laboratory and clinical facilities necessary for the training of such specialists. Almost without exception their organization is on the lines of the old proprietary medical school, their force of instructors is, in most cases, insufficient and sometimes incompetent. Their courses of instruction are incomplete and too short and altogether their standard of requirements is too low. The Committee agrees that it would be advantageous for a physician desiring to specialize to devote two or even three years of study to that end, and that suitable degrees should be offered by the universities to encourage such advanced work. A minimum of one year's study in the various branches of the Department of Otolaryngology is considered necessary to fit such a candidate for the practice of that specialty. Of this year, the Committee feels that eighteen weeks should be devoted to fundamental subjects, and thirty weeks should be allowed for clinical subjects. Or, if desired, these branches may be mixed in that proportion. A complete program is given but in view of the fact that I shall introduce the

<sup>5</sup> Transactions of the American Laryngological Association, 1920.

findings of the special committee of the different societies later on, it is not detailed here.

Beck,<sup>6</sup> in discussing this view of otolaryngology, develops the same ideas as the two previously quoted writers. He also condemns the short-time specialist of many of the postgraduate schools. He believes that the whole question of licensing the specialist should be in the hands of a board of directors selected from each of the five national otolaryngological societies and that this board should have absolute control of the development of otolaryngology, acting as advisor, both to the institution of learning and to the student. This board should furthermore develop the fitness of the applicant for training as well as practice. If the board is satisfied with the applicant's fitness for training, as shown in undergraduate studies, his internship and special attention to this branch of medicine, he should be referred to a clinician with whom he will work for one year, after which he may be directed to a proper school for further study. Beck also gives an elaborate outline for such a course which corresponds in the main to the Chicago idea, the roster of the committees to be given later, and also to the courses actually in operation in several large cities at the present time. A student who has satisfactorily completed such a course should then return to the board of directors with his credentials, receive his properly accredited diploma, and be recognized as a thoroughly trained otolaryngologist, after which, with a general introduction from the board, a tour of observation for four months would be made to the large otolaryngological clinics, of which he should be asked to submit a report, in the form of a thesis.

For some years, Committees under the chairmanship of D. J. Gibb Wishart, and representing the American Medical Association, The American Laryngological Association, the American Otological Society, the American Laryngological, Rhinological and Otological Society and the American Academy of Ophthalmology and Otolaryngology, have been working on the problem of preparing a list of minimum requirements for such a course and their report has just been published. It will be found in the Transactions of these Societies and it is given here in some detail. With modifications according to the preferences of various institutions, it is actually in operation in a number of teaching centers in this country, so that it is believed that the student now has the opportunity of becoming thoroughly trained in this specialty. At least two universities now offer a one-year course similar to the above for which a certificate is granted if the work is completed satisfactorily; while an optional second year to be devoted to clinical and research work will lead to a degree.

CURRICULUM RECOMMENDED AS THE MINIMUM WHICH SHOULD BE FOLLOWED BY THOSE WHO SHALL HEREAFTER SEEK TO BECOME RECOGNIZED AS SPECIALISTS IN OTOLARYNGOLOGY.

Believing that the lack of proper special education on the part of those who claim to be specialists in otolaryngology has been disclosed by

<sup>6</sup> Journal of the American Medical Association, May 22, 1920.

the experiences of the office of the Surgeon-General in attempting to secure for the American Army a service in otolaryngology which should be the equal of that of the other subdepartments of medicine, this committee representing the American Medical Association, and all the societies upon this continent, in connection with the specialty, recommend the adoption of the following as a satisfactory minimum for the guidance of those who desire to take up the specialty.

1. (Preliminary). The candidate must recognize that it is impossible to diagnose and treat a patient with an affection of the ear, nose or throat, skilfully, without a sound knowledge of general medicine, and to that end should either have practised as a licensed practitioner, for four years, or have acted as an interne, in a class A general hospital, for at least one year.

2. The candidate who possesses the above qualification should then proceed to prepare himself for the study of the specialty by pursuing, in the postgraduate department of a university, the following course of study, namely:

(a) Anatomy of the head, neck and chest, embryology and histology . . . . .	100 credit hours
(b) Pathology and bacteriology . . . . .	100 "
(c) Operative work upon the cadaver . . . . .	100 "
(d) Physics . . . . .	32 "
(e) Physiology . . . . .	30 "
(f) Neurology . . . . .	20 "
(g) Hygiene and public health . . . . .	10 "
(h) Reading of radiographic plates.	
(i) Knowledge of the teeth, mouth and their diseases.	
(j) General surgical technic.	

The above course should occupy the candidate from four to five hours daily for a period of six to nine months, and he is advised to spend the remaining portion of each day in attendance upon an out-patient clinic in otolaryngology.

3. Subsequent to the completion of the above course, the candidate should secure a position as intern in a hospital especially devoted to diseases of the ear, nose and throat, or in a general hospital possessing an adequate otolaryngological service. The period occupied in this portion of his training will vary, but should not be less than sixteen months.

The candidate must recognize that the above course is only a minimum, and that if he desires to rank as a first class specialist he must further pursue special study, either on this continent or abroad, in centers where opportunity is afforded to follow the work of those devoting their time to certain special fields in otolaryngology.

## THE NOSE.

**External Deformities.** In 1918, we reported the end-results obtained by Carter<sup>7</sup> in his bone and cartilage transplants for correcting saddle-shaped deformities of the nose, as determined by x-ray studies at periods

<sup>7</sup> PROGRESSIVE MEDICINE, March, 1918.



varying from four months to as many years after operation. In the same issue Babcock's technic of using boiled bones, "soup bones," was given in detail, but end-results were not known as the method was of too recent origin, though it was stated that after several months, the implants had not, apparently, been absorbed. An experimental study of bone fragments which were buried deeply in the thigh muscles of dogs has been made by Ely<sup>8</sup> with the following results: In 7, fresh bone was used and was found to have disappeared in 694 and 975 days in 2 cases, while it was recovered in 5 cases after 17, 374, 473, 922 and 1103 days. Where boiled bone was implanted, it had disappeared earlier than 544, 720, 790 and 930 days, and was found only once in 5 cases on the fiftieth day but very much reduced in size. His conclusion is that living (or raw) bone resists absorption better than devitalized bone, but that it also is absorbed in time, as a decrease in the size of the fragments recovered was almost invariably noticed, and also that they had decreased in density. The experiment showed that both bone and marrow in the buried fragment of living bone died, the marrow being reformed by bloodvessels pushing in from the surrounding tissues, and a certain amount of new bone being laid down upon the old, especially along the margin of the trabeculæ.

Lee Cohen<sup>9</sup> gives some useful practical points for reconstruction of nasal deformities by transplants. He has been a hard and successful worker in this frequently neglected field, and valuable lessons may be learned from his large experience. Bone is always used in situations where bone formerly existed, and cartilage employed, when possible, where the supporting framework had consisted of cartilage. Following this principle, in placing a graft over the dorsum nasi, the upper two-thirds to rest upon the nasal bones is removed from the bony rib adjacent to the costal cartilage, whereas the lower third is of the cartilage itself, all removed in one section. This method is also advocated by Carter and others. A graft so constructed has two advantages: First, it furnishes a more or less elastic and mobile support for the lower end of the nose, less liable to fracture; second, the ease with which cartilage may be cut with the knife enables one to shape it as desired for the tip of the nose.

Rib transplant is preferred to tibia transplant for the above reasons and because it has been found in several instances that the tibia graft has not grown fast to the underlying bone, whereas the rib after a few months was so firmly fixed that it appeared to have actually become a part of the nasal bones. These results were verified clinically by several years' observation and by the x-ray which demonstrates new bone formation. These conclusions bear out those of Carter<sup>10</sup> in this respect.

Not a few of the cases requiring this operation were the result of a too liberal removal of the septum during the performance of the submucous resection. The editor has personally rarely observed this result.

<sup>8</sup> *Annals of Surgery*, December, 1919.

<sup>9</sup> *Southern Medical Journal*, March, 1919.

<sup>10</sup> *PROGRESSIVE MEDICINE*, 1918.

Cohen emphasizes the details of obtaining the rib-graft. The seventh or eighth rib is exposed by the usual incision and a section three-sixteenths to one-four inch wide and of the necessary length is taken from the center of the outer table down to the diploetic structure with a sharp, narrow chisel. A strip of cartilage slightly wider and thicker is cut from the adjoining cartilage, care being exercised not to break the connection between the two portions. In this way a small part of the rib shaft is removed which does not weaken the support of the chest, injury to the intercostal vessels and nerves is avoided, and danger of pleural perforation is reduced to a minimum. Periosteum and perichondrium are always removed with the graft. This covered side is placed next to the skin. The graft is placed in position, subcutaneously, through incisions within the vestibule, through which the necessary undermining of the skin has also been done. If there is no septal support for the tip of the nose, it is necessary to furnish some substitute for the lower end of the dorsal graft to rest upon. For this purpose a thin section of costal cartilage is inserted between the layers of the nasal mucosa, separated as in the submucous operation, the lower end of which rests upon the anterior nasal spine, the graft resting upon the upper end. A flaccid column is thus supported. Should a septal perforation make this procedure impossible, small cartilage grafts are placed in each ala nasi, one end resting on the maxilla and the other against the dorsal graft, supplying adequate support.

"The following conditions should be carefully adhered to: Prevent infection by careful asepsis of the field from which the graft is taken and that to which it is transferred, never allowing the graft to touch the skin edges during manipulation. Avoid handling implants with the fingers, gloved or ungloved, but hold with sterile forceps or some other suitable instrument which has not been used during the operation for any other purpose. The recipient wound should be freed of all blood clots, and active bleeding should be stopped before planting the graft. Finally, one must be certain that the under surface of the graft is in contact with bone freed entirely of periosteum. With a small periosteal elevator the removal of this membrane from the top of the nasal bones, as well as from the frontal notch above, is easily accomplished.

"Sterile salt solution to prevent drying of the graft, though advocated, is not essential. By preparing the field for receiving the graft before taking it from the site of supply, the operation can be done so expeditiously as to avoid harmful desiccation, at the same time preventing a possible infection, however remote, from the use of a solution which may have become contaminated."

**Operation for Drainage of the Lacrimal Sac.** This is one of the borderline topics of interest to the ophthalmologist and rhinologist alike, for when the former fails to obtain a cure by probing and irrigation, he hopefully, or hopelessly, calls the latter in to share the credit or discredit as the case may be. Numerous operations have been devised by members of both specialties, which come under two main classifications—drainage to be obtained by external or by intranasal means.

Toti's operation belongs to the first, or external route, class, and

Fischer<sup>11</sup> believes that this method deserves more consideration. It differs from total extirpation of the tear sac in that the nasal wall of the sac only is removed through a skin incision and a window corresponding to this opening is made through the bony wall into the nasal cavity, through which tears flow into the nose. It is done usually under local anesthesia and it is important that the puncta and canaliculi should be in normal condition, neither blocked by fibrous tissue, nor slit. The results in most cases are good, there being a good passage for tears into the nose and an easy passage of the sound. The pyogenic membrane is not removed as in extirpation, but the pus drains into the nose, is not annoying, and frees the eyeball from danger.

This author finds that in most of these cases there is a suppurative ethmoiditis which is probably the original cause of the trouble, confirming the views of many others, though differing from West who only found it in rare instances. The external scar is considered a negligible factor.

Mosher<sup>12</sup> has designed an intranasal duct operation along anatomical lines by draining the sac into the unciform fossa. It is the unciform fossa that is the field of the operation described. Briefly, the operation consists in first removing the anterior end of the middle turbinate and as much of the superior overhang of the middle turbinate as possible. This should fully expose the unciform process, and through the dilated or slit punctum lacrymalis, the author's stiff probe is inserted and carried downward into the inferior meatus. An incision is now made with a knife along the posterior edge of the ascending process of the superior maxilla, beginning the cut through the mucous membrane and periosteum at least as high as the level of the anterior attachment of the middle turbinate. The incision is carried downward and slightly backward paralleling the edge of the ascending process of the superior maxilla. It stops at the upper border of the inferior turbinate. The posterior edge of the ascending process can be located by palpating the unciform fossa from behind forward with a right-angled knife. The thin floor of the fossa yields readily under the pressure of the knife point but meets firm resistance as soon as the hard bone of the superior maxilla is reached. From the bottom of this vertical incision, a horizontal incision is made along the upper rim of the inferior turbinate for about half an inch, well through the lower part of the unciform fossa. A second horizontal incision is carried backward from the top of the vertical cut across the upper limit of the fossa and over the inner face of the extreme upper part of the unciform process. The flap thus marked out is dissected loose with a semi-sharp elevator. The upper part of the flap may break away at the upper posterior portion, and this is somewhat of an advantage. It is now tucked backward and downward exposing the unciform fossa. There is danger here of perforating into the antrum, and care must be exercised to avoid this, as pus from the opened sac could easily infect the latter cavity. The next step consists in curetting through the inner

<sup>11</sup> Ztsch. f. Augenh., 1918, xxxix, 1, abstracted from Survey of Head Surgery, January, 1919.

<sup>12</sup> From the Laboratory of the Anatomical Department, Harvard Medical School.



wall of the lacrimal cell. The aim of the operation is to remove only the upper anterior part of the unciform process where this forms the inner wall of the cell, but not the process itself. Now the probe is partly withdrawn, at the same time making pressure inward with its point. As soon as the point escapes from the upper rim of the inferior turbinate, it breaks through the inner wall of the nasal duct into the unciform fossa. The point of the probe being swung strongly upward at this point lays open thoroughly the inner wall of the nasal duct and lacrimal sac. The probe is now reintroduced and the whole length of the posterior surface of the ascending process of the superior maxilla is scraped with a right-angled curette. The bed of the duct is widened by biting away the anterior part of the inner wall of the duct, thus doubling its width.

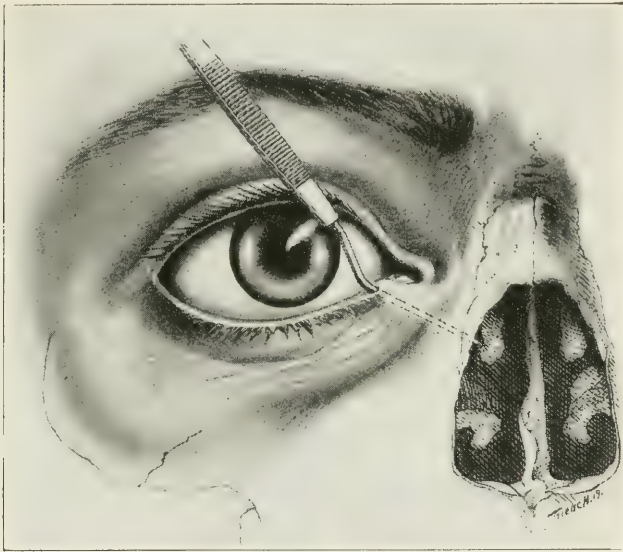


FIG. 35.—Direction of probe as it is forced into nose from bottom of sac.  
(Wiener and Sauer.)

A ligature carrier is passed from the nose out through the punctum and a stout silk thread carried through, to the middle of which is attached a small piece of gauze. The flap is smoothed into place and traction on the eye end of the ligature draws the tampon over it, holding it in position. This is left in place for two or three days, but when the plug is withdrawn the ligature still remains for five days longer. After the subsidence of reaction, probing is instituted and must be continued for varying lengths of time.

Wiener and Sauer<sup>13</sup> also offer a similar modification of the West intra-nasal operation. A probe is introduced through the inferior canaliculus, passed downward till it reaches the bottom of the sac and then turned inward at an angle of 45 degrees and forced through the external nasal

<sup>13</sup> Journal of the American Medical Association, September 25, 1920.

wall into the nasal cavity. The entry into the nose is made in front of the middle turbinate. If the anterior end is very large, a portion of it must be removed. The probe is now slowly withdrawn and followed closely by small punch forceps which bite away as much of the bony

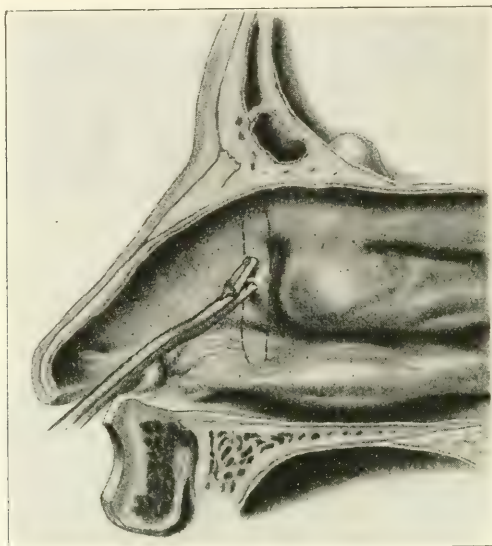


FIG. 36.—As probe is slowly withdrawn, under blade of forceps is slipped in and bony wall and mucous membrane of nasal wall of sac is removed. (Wiener and Sauer.)

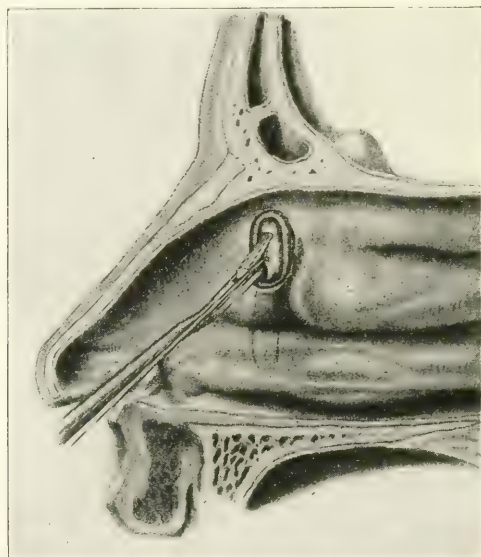


FIG. 37.—Sac is pushed through opening with probe, grasped with tenaculum and large piece punched out. (Wiener and Sauer.)

covering of the duct and sac as is necessary for permanent drainage. This opening is extended upward until the probe can enter the nose almost horizontally. A portion of the sac is pushed with the probe into the opening made in this manner and grasped with biting forceps. As the probe is withdrawn, the forceps' jaws are closed and the inner wall of the sac bitten off. Subsequent treatment consists in probing every few days and attending to granulations. It is claimed that by this method prolonged probing is not necessary, complete cures resulting in approximately four weeks. The operation is simple and easily performed, and deserves an extended trial.

**Malignant Growth of the Nose and Throat.** Mixed tumors of the face are most often seen in the parotid or submaxillary region and are often called tumors of the salivary glands, although they are in no way related to them and may occur in various parts of the throat, mouth or face. They are usually classed as semimalignant in character. New<sup>14</sup> reviews the history of 68 such cases in the Mayo Clinic. The diagnosis of mixed tumors in some cases must be made microscopically, but in the pharynx, palate, and the submaxillary and parotid regions, a clinical diagnosis is not difficult to make. It is a hard tumor which feels malignant and has usually existed for several years, during which time it has been slowly enlarging without breaking down. It is usually freely movable and is not regarded until it has attained considerable size when the patient begins to notice it and comes in for examination. If the growth is in the pharynx and palate, it must be distinguished from a nasopharyngeal fibroma. Treatment of the mixed tumor is surgical. If it is in the pharynx, it should be removed either through the mouth or through the submaxillary and submental regions, depending on the size and location of the tumor. Palatal tumors may be enucleated under general or local anesthesia, but, if the tumor is fixed to the bone, a general anesthetic is preferable so that the bone may be cauterized with a soldering iron in order to prevent recurrence. If the antrum is involved, the soldering iron should be carried up into the antrum so as to coagulate the tumor, the technic of which will be given later on in this article. The difficulty in removal of tumors in the parotid region lies in their close relationship to the facial nerve and, in some instances, particularly in women, it seems best to attempt to check the growth by radium rather than risk the deformity of a facial paralysis. On the whole, though, radium has given very few favorable results. Dean, discussing this paper, says that he finds the mixed tumor, of the types mentioned, to be rather rare. As it is only a semimalignant tumor, a mutilating operation is not necessary.

For the removal of large growths in the epilaringeal regions, Trotter<sup>15</sup> has devised a lateral pharyngotomy. It is necessary that the tumor should be freely exposed before its removal is begun in order to obtain the best chances of cure, and since practically all of the tumors in question are epitheliomata, adequate exposure means exposure of the mucous surface from which the tumor is growing. It has been the defect of

<sup>14</sup> Journal of the American Medical Association, September 11, 1920.

<sup>15</sup> Journal of Laryngology, Rhinology and Otology, October, 1920.



much operative work that the exposure and the removal of the tumor have not been designed as distinct procedures, comparatively inde-

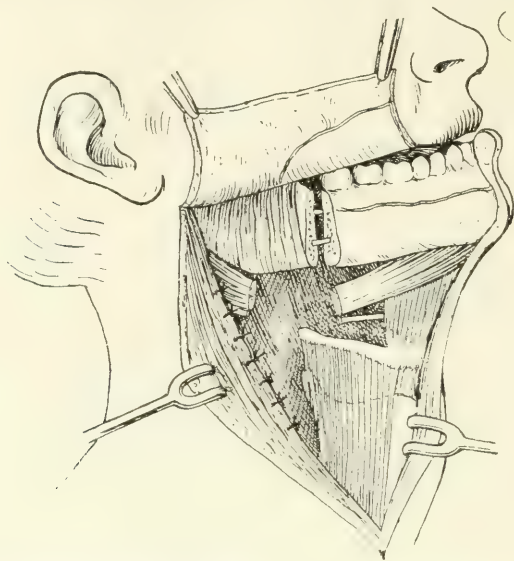


FIG. 38.—Sternomastoid sutured across vessels. Jaw and digastric divided. (Trotter.)

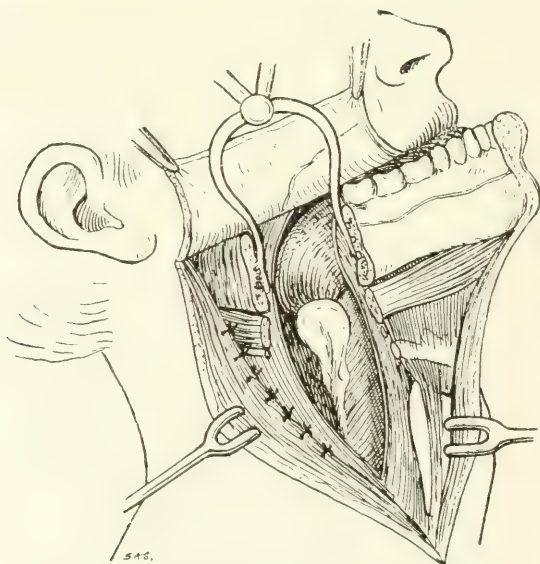


FIG. 39.—Incision in pharynx. (Trotter.)

pendent of one another. The best method to reach these growths is through the lateral wall of the pharynx by which easier access and much greater exposure is secured. The advantage of this route is that it has

no natural limits above and below, so that the whole length of the pharynx, and even of the cervical esophagus, can be laid open. He divides this operation into an upper and a lower pharyngotomy, both of which may be combined if greater exposure is desired. Superior lateral pharyngotomy consists essentially in dividing the mandible immediately in front of the masseter and then incising the superior constrictor in front of the tonsil. Inferior lateral pharyngotomy consists in removing the great cornu of the hyoid and the ala of the thyroid cartilage, after reflecting the middle and inferior constrictors from these. Thus the aponeurosis of the pharynx is freely exposed. To deal with the region of the epiglottis and with large tumors of the upper laryngeal opening, a combination of these two operations gives satisfactory exposure. Incisions are made along the sternomastoid near its anterior edge from the lobule of the ear to the cricoid, and vertically through the middle line of the lower lip, over the chin and then along just below the lower border of the jaw to join the first incision. The sternomastoid is retracted and a gland dissection is done, dividing the following structures: posterior belly of the digastric, stylohyoid muscle, common facial vein, anterior branches of the external carotid artery, superior laryngeal, hypoglossal and lingual nerves. The ends of the hypoglossal nerve should be secured in order that they may be sutured later. The larynx and pharynx can now readily be displaced forward and the carotid vessels backward. The sternomastoid is folded inward over the great vessels and stitched to the prevertebral muscles, as a valuable precaution against spreading infection and secondary hemorrhage. The infrahyoid muscles are detached from the hyoid and thyroid and turned backward as are the middle and inferior constrictors. The great cornu and the thyroid ala are removed from the underlying pharyngeal wall which has now been freely laid bare but is still intact. The mandible is divided in the usual manner, being drilled for wiring before it is sawed through. After dividing the styloglossus muscle and the lingual part of the superior constrictor, the lateral wall of the pharynx is incised through its length, care being taken to avoid the tumor. Complete exposure of the largest growth of the epilaryngeal region is thus attained. It is found that necrosis frequently occurs in the jaw if teeth are present, but when the mouth has been rendered edentulous, necrosis never occurs.

The treatment of cancer of the aural cavities, jaws and throat, is frequently best carried out, according to Clarke,<sup>16</sup> by electrothermic methods alone or in combination with surgery, x-ray and radium. Frequently, only one electrothermic operation is necessary to destroy malignant tissue, including bone involvement in the regions just mentioned, and it is not necessary to make extensive surgical exposure before this method can be applied. At times it is advisable, however, to employ coagulation first and then excision of the coagulated mass, in this manner avoiding primary hemorrhage. Even secondary hemorrhage rarely occurs. The two methods under consideration are electro-

<sup>16</sup> Journal of the American Medical Association, October 26, 1918.

desiccation and electrocoagulation. The former is used for destroying malignant growths of small size by the utilization of heat of just sufficient intensity to dehydrate the tissues. Electrocoagulation is produced by a bipolar high frequency current of the Darsonval type and is much more penetrating and intense in action. It is, therefore, used to destroy large growths, including those of involved bone. When the antrum or other structures, not easily accessible, are involved, or when normal tissue covers the growths, it may be necessary to expose them by surgery as a preliminary to electrothermic treatment, which follows immediately after, thus avoiding hemorrhage and reaching malignant tissue not accessible to instrumentation. If the field of operation is the base of the tongue, epiglottis or larynx, a tracheotomy is first required, and packing of the larynx practised to prevent aspiration of toxic secretions. Deep cross-fire roentgen therapy should be applied to the glands of the neck whether or not they show involvement. This may also be used following electrothermic destruction at the seat of the primary lesion, to reach possible outlying cancer cells. Radium is also valuable for this purpose but the same area should never be treated by both roentgen ray and radium. Clarke states that he has never seen any benefit result from the use of the  $x$ -ray or radium alone in the treatment of cancer of the oral cavity. When recurrence occurs, if it is only locally, there is a chance of success by treating the patient a second time, or a number of times more. But, if the recurrence is in the glands of the neck, further treatment is of no avail.

Delavan<sup>17</sup> reports 4 cases of cancer of the larynx successfully treated with radium. The difficulty in treating this class of case has been in keeping the radium container in proper relation to the growth for a given time, as it is extremely difficult for the patient to avoid movement of the throat. Greene, discussing this paper, alludes to this difficulty and also to the difficulty of making accurate application of the rays to the exact location desired. In all cases, preliminary tracheotomy seems to be essential. He has employed satisfactorily radium emanations in glass containers in the form of small "seeds" which may be inserted and left in the substance of the tumor. Several such seeds containing a small measured dose of emanation inserted in different parts of the tumor mass by means of a trocar provide a cross-fire between the various points of insertion and increase the effectiveness of the different applications. Accurate insertion can usually be made with the patient suspended, and, as the containers are not screened, the seeds must not be placed within 6 or 7 millimeters of normal tissue as otherwise there is risk of ulceration, with disastrous result, such as fatal hemorrhage. Coakley calls attention to the fact that too large a dose of radium results in destruction, not only of the involved area, but of much of the healthy tissue around it. This is particularly true in the region of the larynx for cartilage is very susceptible to the action of radium, as many of us have learned from sad experience. It seems unsafe and unwise to introduce into any larynx any radium tube without first performing a

<sup>17</sup> Transactions of the American Laryngological Association, 1919.



tracheotomy as laryngeal edema almost always occurs. I have personally seen one such case in consultation within the past few months where urgent symptoms required a prompt tracheotomy.

Greene<sup>18</sup> has reported a large series of cases of malignant disease of the larynx of different types treated in different ways. Most of these cases, when first seen, had passed beyond the stage where a cure by surgical means alone could be hoped for. From a study of this series, it is concluded that the external treatment by radiation of laryngeal malignancy may be used in advanced cases with reasonable expectation of palliative results but without hope of curing the local condition. Greene again calls attention to the necessity of a preliminary tracheotomy in order to enable the patient to be comfortable during the treatment and still more important in order to forestall asphyxia from closure of the laryngeal lumen by the later inflammatory reaction. The best results were obtained by insertion of radium seeds directly into the tumor mass, the technic of which is as follows: Preliminary tracheotomy, ether anesthesia administered through the tracheal tube, suspension of the patient with a Lynch apparatus and insertion of the seeds by means of a suitable trocar under direct vision in the location desired. The dosage was 2 to 4 mc., inserted in each treatment according to the size of the growth. This is proved to be by far the most accurate and effective method of attacking the growth locally, and, without exception, a marked diminution in the size of the tumor has resulted in the cases thus treated. Prolonged inflammatory reaction has followed in some cases, with signs of chronic perichondritis lasting in some cases from four to six months before subsiding. In 2 of the cases, severe hemorrhage resulted from the necrosis produced, which in one instance was fatal. Greene believes this extension of necrosis, occurring at considerable periods after the radium application, to be due to a septic process set up by the radium burn and not directly due to destructive action of the rays. The case of fatal hemorrhage came on two months after the last treatment. This method is especially applicable to the cases of extrinsic cancer involving the tissues about the orifice of the larynx in which complete surgical removal would involve excision of the tonsil, extirpation of the larynx, and resection of the upper esophagus. It is believed that in cases of intrinsic cancer, operation by window resection of the thyroid cartilage, leaving the wound open for immediate and subsequent radiation, is a satisfactory method of treatment. As a whole, the cancer cells have been shown to be less resistant to the action of radium rays than normal tissue, but, in order to furnish sufficient strength of dosage to be rid of those tumor cells which have invaded normal tissue beyond the limit of gross inspection, some normal tissue also must be destroyed in the process. Unfortunately, cartilage which forms the framework of the larynx, although peculiarly resistant to the invasion of cancer, is especially vulnerable to the rays. Therefore, inflammation and necrosis are likely to take place, resulting later in permanent stenosis of the larynx. Thyrotomy without radiation has yielded such brilliant results that it is still the method of choice in early intrinsic cancer.

<sup>18</sup> Transactions of the American Laryngological Association, 1920,

Mills and Kimbrough<sup>19</sup> make applications of radium in cancer of the esophagus under roentgen-ray control. They find this method to be preferable to attempted implantation of radium through the esophagoscope as in the latter method traumatism often results and only the proximal portion of the cancerous structure can be observed. Esophagoscopy is useful in determining tissue reaction after radium treatment and in recovering tissue for diagnosis, but it cannot ascertain the permanency of the location of the radium after it is initially placed. This the roentgen rays does admirably and, furthermore, allows change of position under what amounts to direct inspection through the fluoroscope. An initial study of the position and physical picture of the tumor is made by both screen and plate, using a simple mixture of bismuth subcarbonate in water for visualization. The patient is given a preliminary injection of morphine and atrophine, and, in marked strictures, a spoonful of olive oil one-half hour before treatment. Occasionally, preliminary bouginage is useful. The radium is enclosed in a container of German silver 0.5 mm. in thickness and further filtered with 0.5 mm. of brass and a thickness of rubber. It is mounted on a slightly springy drawn silver wire encased in a rubber tube and is introduced in the manner of an ordinary esophageal sound. Under guidance with the fluoroscope, it can be passed into the upper end of the stricture where it is left in position for about three hours and then carried to the lower part of the stricture for a similar period of time. Immediate results of the treatment are usually beneficial, sometimes strikingly so as to the relief of the dysphagia. In several cases there was a return of the dysphagia, which was usually relieved by another treatment. This relief of the dysphagia is the most encouraging feature of the radium treatment of esophageal cancer.

Greene<sup>20</sup> details the treatment of a series of cases of *upper jaw* malignancy. Some of these cases were treated with radium with, or without, operative procedures, and by far the best results were encountered in the cases where surgical removal was followed immediately by radiation. A few were radiated before operation also. The favorite approach for cases primarily in the antrum or ethmoid was by the Moure external incision, but, where little or no involvement of the antrum was shown, the approach was through the mouth. A wide exposure of the growth was secured, all visible tumor removed and a wide opening left for the subsequent application of radium in heavy dosage up to 900 mc. hours. There were 3 deaths secondary to operation, 2 from meningitis and 1 from hemorrhage. Greene concludes that the chief value of radium lies in supplementing, rather than supplanting, operation, and in most cases palliative results, in the way of retardation of the growth and relief of pain, may be constantly expected, even if cure is not obtained.

Barnes,<sup>21</sup> who coöperated with Greene in the series mentioned, devised a plan of leaving a permanent opening in these cases through which inspection might be carried out and radium treatment employed. He

<sup>19</sup> Journal of the American Medical Association, June 5, 1920.

<sup>20</sup> Transactions of the American Laryngological Association, 1920.

<sup>21</sup> Laryngoscope, October, 1920.

believes it is necessary, in the first place, that the tumor during removal should be handled as little as possible, and removed by an incision through the surrounding normal tissue, the growth itself remaining intact in order to avoid implantation or metastasis of the cancer cells. In operations on the sinuses, this rule must be ignored, since no margin of normal tissue can be removed, and the tumor itself must be removed piecemeal. It is here that radium plays its most important role. It may be employed in the preoperative stage to decrease the vitality of the tumor cells and postoperatively it undoubtedly reaches many cells left by the knife that might otherwise migrate. It should, however, be given within a reasonably short time after operation, the sooner the better. A tube with a radiating strength of 35 or 40 mc., screened with steel plates in the center of the antral pack and allowed to remain there through convalescence gives a mild radiation of all the parts without any great reaction. This is probably sufficient to destroy particles of tumor that have been unavoidably left. Subsequent radium treatment should be employed in addition. In order to satisfactorily observe the field after operation, Barnes, as stated above, uses the Moure incision. The front wall of the antrum is removed and the main mass of the tumor evulsed as rapidly as possible with either the finger or the curette. Regardless of anatomical considerations, every particle of tumor tissue and necrotic or soft bone should be removed. A triangular flap of integument, having its base in the upper incision and its apex at the lower limits of the antrum, is removed from the cheek, thus leaving a permanent opening into the operative cavity through which radium can be applied. The first tube remains in place for about two weeks, and is to all intents and purposes inert at the end of convalescence. The rule, thereafter, is to give the patient three or four subsequent weekly radium treatments, even when all of the gross tumor tissue was successfully removed and when no signs of recurrence was present.

Duane<sup>22</sup> has been using the glass tube container for radium emanations for over five years. Since direct action of rays from a radio-active substance on a cell appears to be more pronounced during mitosis than at other times, prolonged radiation ought to be more effective than short radiation for there would be more chances of catching a greater number of cells during their more vulnerable period in the former than in the latter case. The advantages of this method are that the active source of the rays may be placed and kept in position with precision, thus insuring an accurate distribution of the radiation throughout the tumor. The length of time may be prolonged continuously for days, weeks or months. The seeds are introduced as described above and left in place until practically all of the emanation has disappeared. Half of the given quantity of the emanation disappears in slightly less than four days so that in this way the tumor tissue may be subjected to weak radiation lasting a long time. The seeds are allowed to slough out with the tumor mass.

New<sup>23</sup> prefers to use heat in the form of a soldering iron instead of sur-

<sup>22</sup> Transactions of the American Laryngological Association, 1920.

<sup>23</sup> Journal of the American Medical Association, May 8, 1920.



gical dissection of these tumors of the upper jaw. He believes that there are two advantages in this method of treatment; the elimination of operative mortality, and a marked decrease in the percentage of cases showing recurrence. Radium should always be used secondarily. The great value of the use of slow heat in contrast to any cutting operation in malignant disease is that it penetrates far beyond the point at which it is applied. The patient is anesthetized with ether and the mask then removed. The head of the table is lowered to prevent secretion draining into the trachea. A water-cooled retractor is inserted under the lip on the diseased side and the growth is attacked at the point at which it appears in the mouth, either through the plate or from above the alveolar process. The soldering iron is used as a cautery at a dull heat since red iron carbonizes and prevents the penetration of heat. It is carried up gradually into the antrum and the entire growth is thoroughly cooked from thirty to forty-five minutes. There is practically no bleeding accompanying this treatment, and the antrum can be readily inspected from time to time. The aim of the treatment is to entirely eradicate the growth at the time of the first operation by the use of thermocauterization followed by radium. New prefers the use of radium by the insertion of multiple needles in the wall of the antrum from the outside repeated in three weeks, if indicated, and the patient kept under monthly observation. Following the treatment, most of the inside of the antrum comes away as a sequestrum in two months' time, leaving large openings in the palate which must be closed later by prosthetic appliances. No complications have followed this treatment and there has been no operative mortality.

**Nasal Accessory Sinuses.** The comparative value of the *x*-ray plate and transillumination in diagnosis of disease of the frontal and maxillary sinuses is still a debatable question, depending on the anatomic relationship, the *modus operandi*, and on how much the observer has studied the various methods of each while comparing his diagnosis with his surgical findings. According to Briggs,<sup>24</sup> both are valuable, but certain methods in the use of each give much superior results to others. Taken jointly and in connection with other signs and symptoms, they often prove to be determining factors in establishing a diagnosis or suggesting proper therapeutic procedure. The roentgenogram better outlines the sinuses and offers definite limits to guide the operator, and it alone furnishes positive evidence of absence of a frontal sinus, the shadow of which by transillumination might indicate an infected sinus. Transillumination requires less skill, and is quickly and inexpensively done by the clinician himself. In any case, the clinician should interpret the *x*-ray plates for himself, in the light of his clinical studies, a point that some of us have been insisting upon for years.

The position of the patient in relation to the plate is of the greatest importance. Briggs prefers, for the antrum, the chin-nose position with the rays passing through the parts at right angles to the plate. For the frontal sinuses, the nose-forehead position is the best, though it does not

<sup>24</sup> Journal of the American Medical Association, July 31, 1920.

show so well the orbital extensions, because of the shadows caused by the lesser wings of the sphenoids. Needless to say, this is a defect, as it is this information that the operator is most anxious to obtain.

A new method of transillumination is offered by which it is claimed that light is transmitted more directly through the antrum than by the usual mouth method where the bulk of the light penetrates the floor of the nose and proceeds thence through the lower outer nasal wall through the antrum to the cheek. In this method, the light is placed against the lower lid above the infra-orbital notch and pushed downward until the infra-orbital ridge is well passed. An area of pink is now seen on that part of the roof of the mouth and the buccal wall on either side of the alveolar process corresponding to the floor of the antrum. It is claimed that the light directed in this manner passes through a third less bone and still less soft tissue than by Heryng's technic, and the usual diseased areas around the outer floor of the antrum are more fully revealed.

THE ETHMOID. Skillern<sup>25</sup> has analyzed the causes for failure to cure a larger percentage of cases of chronic ethmoid suppuration and believes that the fault is largely because sufficiently careful study is not devoted to the problem. The diagnosis of ethmoid suppuration is, for the most part, easily made, but failure to obtain satisfactory results comes from indiscriminate curettage of all the cells, infected or otherwise, thus spreading the infection to hitherto uninfected portions of the labyrinth. This process is aided by the fact that invariably there is much partially divitalized tissue remaining which fails to resist infections and the end-result is continuation of discharge with crusting, even though pressure symptoms are relieved. The problem is what to do for those cases that have been previously unsuccessfully operated upon. The solution appears to be a thorough x-ray study to detect the presence of aberrant or outlying cells in the frontal, superior maxillary and palatal bones—cells that may easily be overlooked and thus escape drainage by operation. A study of many cases of ethmoiditis will reveal the fact that not all portions of the ethmoid are infected, and Skillern deplores the tendency to operate radically upon the whole mass, though it is much the easiest procedure. Instead, he advocates draining only such cells as careful study reveals to be infected, even though it may mean several operations, and carefully conserving all healthy ethmoid structure or such as seems capable of regeneration. In this way the destruction of function of the nasal mucosa is held at a minimum. Of course, concomitant suppuration of the remaining sinuses must not be overlooked.

Sullivan<sup>26</sup> also makes a plea for more careful study of ethmoid cases and more conservative operating upon those not found to be wholly infected. Time spent in diagnosing and cleaning up the simple as well as the more obscure conditions is the best way of preventing the more chronic lesions. It takes more than one examination to prove that sinuses are healthy or the reverse, and the x-ray is by no means infallible. The removal of the turbinates preliminary to, or as part of, the sinus operation is deprecated, although it is admittedly often necessary in

<sup>25</sup> Laryngoscope, November, 1920.

<sup>26</sup> Pennsylvania Medical Journal, July, 1920.

diagnosing sphenoid infection. Infraction of either turbinate is, on the other hand, strongly advocated. For the ethmoids, the middle turbinate is broken away from the naso-antral wall and as much or little of the labyrinth as desired, removed. The turbinate is then pushed back into its original position. This procedure is also used for operating upon the maxillary sinus through the middle meatus. If the route through the inferior meatus is desired, the inferior turbinate is inflected and later replaced.

Faulkner's<sup>27</sup> operation upon the ethmoid cells is in reality a modification of the Mosher operation with instruments of his own devising. The initial step is the incision of the mucous membrane on the whole length of the under surface of the base of the middle turbinate. The next step is performed with a straight curette having a large sharp-edged spoon with one straight side. With this the inner wall of the agger-nasi cell is crushed in and the curette turned 45 degrees backward, riding over the middle turbinate, which is broken off with a downward sweep. The cells are now cleaned out with a large, dull ring curette. If this procedure is thoroughly carried out, intranasal enlargement of the nasofrontal duct will rarely be necessary.

**THE MAXILLARY.** For continuous drainage of the antrum without making a surgical opening, Unger<sup>28</sup> proposes an instrument which he calls an intubator. It consists of a metal tube, split lengthwise, bent to a short semicircle at the tip. A rubber catheter is inserted in this tube and it is passed into the nose with the beak up, until opposite the hiatus semilunaris. It is then turned outward and downward into the hiatus and the rubber catheter pushed through the ostium into the antrum. When the two halves of the intubator are removed, the catheter remains in the antrum indefinitely, providing ventilation, drainage and ease of irrigation. This method can be used in only about 50 per cent. of cases, a hypertrophied middle turbinate or a high position of the hiatus often preventing its accomplishment.

This procedure may interest those who have read Gording's<sup>29</sup> elaborate description and explanation of serious complications following puncture of the antrum. I know that since this appeared many rhinologists have been more cautious about their diagnostic punctures and have had misgivings while doing them. Nine cases with serious symptoms are gathered from the literature of the specialty, 4 of them having fatal terminations, and 7 cases, with 2 deaths, occurred in the practice of the author or his colleagues. These symptoms have usually been attributed to cocaine poisoning, to trigeminal irritation or to air embolism, but post-mortems have failed to confirm definitely any theory. The symptoms are usually sudden coma, fixing of the eyes, respiratory paralysis and cyanosis, with full, slow pulse at times, at others small and hardly perceptible, hemiplegia or convulsive attacks and at times death is instantaneous. Some of the cases reported may have been due to cocaine poisoning, but this does not account for the majority. Elaborate animal

<sup>27</sup> Laryngoscope, February, 1920. Transactions of New York Academy of Medicine.

<sup>28</sup> Laryngoscope, September, 1920.

<sup>29</sup> Annals of Otology, Rhinology and Laryngology, June, 1920.



experiments rather confirm the air embolism theory. It was observed that in passing the Lichtwitz needle into the antra of rabbits, if the puncture was made slowly, the mucous membrane was often stripped from the naso-antral wall in front of the needle point, so that if air had been injected, a great deal could have entered the open vessels of the bone and periosteum. These observations were confirmed by making slow needle punctures on patients on whom the radical antrum operation was being performed so that the action of the needle point could be watched. If the bony wall is thick, the needle often enters slowly, but, when thin, the puncture is quickly made and the mucoperiosteum is punctured cleanly.

Opinion with regard to the cause of death in these cases differs greatly. Some consider that it has been a "lung death." The air is driven out by the right heart into the lung capillaries, which are embolized, and the circulation is interrupted, with death as the result. It has sometimes been supposed that the air emboli have become fixed in the small vessels of the central nervous system, thereby causing a "brain death." Most writers seem to incline, however, to the view that the cause of death should be looked for in a paralysis of the heart, and that thus the death as a rule has been a "heart death."

In one of two of the fatal cases reported, postmortem examination failed to show any loosening of the mucoperiosteum, and the serious symptoms only appeared when the solution was injected. In one instance (Killian's case) the solution was cold, which brings up the question of an antral reflex, comparable to the pleural reflex sometimes observed in puncturing the pleura.

As previously pointed out, the serious symptoms appear seldom, but, when they do occur, are fraught with the greatest danger to the life of the patient. This apparently simple operation is, therefore, not entirely free from risk. To avoid this risk, in the light of what we now know, two factors are of importance: One is the stenosed ostium maxillare, and the other the thick, firm antral wall. If the ostium is so small or obstructed that air or water will not pass through without too greatly increasing the pressure in the antrum, the lower opening should be made sufficiently large to allow for their easy exit. If the wall is so thick that the needle will only pass through slowly, with danger of loosening the mucosa, it is better to withdraw the trocar and attempt to work through the middle meatus, but if it is imperative that the lower route be chosen, aspiration should replace the injection of air.

Skillern<sup>30</sup> describes an unusual form of maxillary sinusitis. His patient had been annoyed for several months by the presence of free postnasal bleeding and later the expectoration of large masses of clotted blood which always were discharged *via* the posterior nares. Examination showed the right antrum normal, but the left was filled with apparently pure unclotted blood. Daily irrigations after a time changed this into a purulent secretion but this never entirely ceased. Bacteriological examination of the blood from the sinus showed an abundance of strepto-

<sup>30</sup> Annals of Otology, Rhinology and Laryngology, June, 1920.

coccus hemolyticus. Soon afterward, the right maxillary sinus became involved in a similar manner and ran the same course. On both sides, as soon as irrigations were discontinued, the purulent character of the discharge disappeared and it reverted to its original hemorrhagic type.

The Surgical Treatment of Dental Cysts of the Superior Maxilla is considered by Sourdille,<sup>31</sup> who says that the operative measures consist essentially in a wide resection, by the buccal route, of the bony external cyst wall. The closure of this open cavity in the vestibule of the mouth is not easily accomplished. It may granulate slowly to complete obliteration, it may become infected and form a fistulous opening under the lip, or it may become epidermatized and form a permanent diverticulum in which food collects. Jacques advises, to avoid this inconvenience, resection of the bony partition which separates the cyst from the nasal

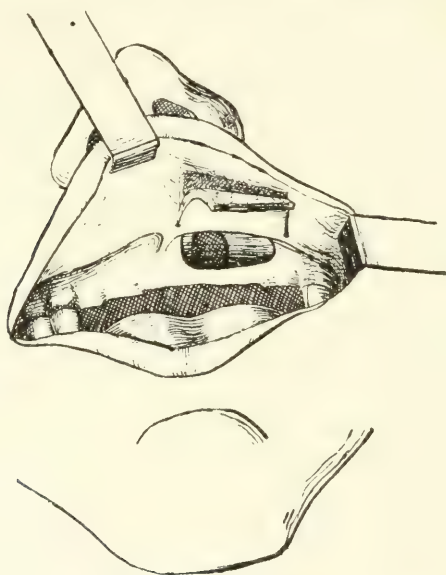


FIG. 40.—(Sourdille.)

fossa or the antrum, instituting naso-antral drainage in the latter case, and closing the wound under the lip as in the Caldwell-Luc operation. Where there is a permanent fistulous opening already established, Sourdille has devised a simple plastic procedure that appears to be effective. As the taking of a plastic flap from the gum is not feasible on account of its great retractability when freed from its attachment to the alveolus, the flap must be cut from that portion of the mucous membrane surface of the lip immediately adjoining the fistula to be closed. The flap should be thick, as long as the height of the lip will permit and wider than the orifice to be closed, and the operation should not be attempted until cicatrization of the opening into the cyst is

<sup>31</sup> *Revue de Laryngologie, d'Otologie et de Rhinologie*, March 31, 1920.

completed or within six weeks of the first surgical intervention, and only where there is nasal or antral drainage of the cyst according to the Jacques method.

The operative technic may be summarized as follows:

1. Refresh the inferior and lateral surfaces of the cystic cavity with the curette, including also the inferior and lateral borders of the buccal orifice. Do not touch the upper border (Fig. 40).

2. Trace and cut the flap from the lip with its base above.

3. Push down and engage the flap across the orifice to be obliterated, the raw surface being brought downward against the freshened floor of the cavity, the mucous surface being uppermost. This goes to form the floor of the nasal fossa and antrum.



FIG. 41.—(Sourdille.)

4. Liberate the two vertical lips of the labial wound and suture with horse-hair or silk. This suture prevents the flap springing back into place on the internal surface of the lip, and the pressure of the lip against the dental arch maintains it in the cystic cavity (Fig. 41).

Equal in annoyance, and somewhat similar in origin and symptoms, is a permanent fistula through the alveolus into the antrum whether caused by a carious tooth socket or caries of the alveolar process following a radical maxillary operation. Usually, according to Stucky<sup>32</sup> a thorough radical surgical cleansing of the antrum and curettage of the fistula will suffice for a cure, but where the opening is too large for this to occur, Welty<sup>33</sup> uses an original plastic operation for the purpose. If a radical operation has not been previously performed, it must be done,

<sup>32</sup> Journal of the American Medical Association, September 25, 1920.

<sup>33</sup> Ibid.



all necrotic bone removed and infected adjoining teeth extracted. Under general anesthesia, an incision is made at each end of the fistula on the outer side of the alveolus and carried well up to where the bone has been removed in the antrum operation. After dissecting loose the muco-

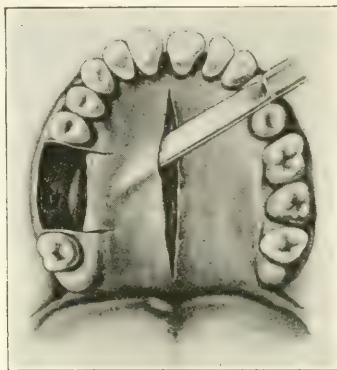


FIG. 42.—Incision and elevation of periosteum and hard palate, and incision from each side of fistula. (Welty.)

periosteal flaps thus outlined, the bone of the alveolus is removed, leaving a large opening into the antrum. An incision is now made in the median line of the hard palate for its entire length and the periosteum

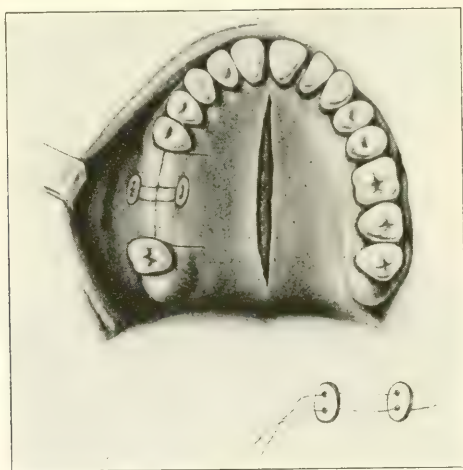


FIG. 43.—Wound approximated and held by metal plates; suture extending through tissues instead of over them, as shown in the elevation. (Welty.)

elevated over the entire area on the side of the fistula. This, of course, is to relieve tension when the flaps are drawn together over the fistulous opening. This is accomplished by drawing together the prepared edges of the old fistula and securing them with sutures passing through two

perforated lead disks to avoid cutting. These are left in place ten days, and the fistula should be closed permanently at that time.

**THE SPHENOID.** As he has done now for several years past, Dean<sup>34</sup> has contributed another piece of research work in the Indication for Operation on the Nasal Sinuses in Children. Operative procedures for nasal sinusitis in children are not often indicated, as the acute infections are readily cured or disappear of themselves. Chronic empyemas in children yield to non-surgical procedures much more readily than in the adult. This is partly because, in young children, nasal obstructive lesions are not common. During three years, routine examination of the sinuses was made in 1108 infants, and children under fourteen years of age and a large number of chronic empyemas were discovered. Approximately 80 per cent. were cured by the removal of diseased tonsils and adenoids. Although infections with hemolytic streptococci are very resistant to treatment, some of these were included in those cured in this manner. Cases associated with atrophic rhinitis and syphilis were not so beneficially influenced by this procedure, but responded rapidly to simple ventilation and drainage. When treatment without operative intervention has failed, it is only in rare instances that extensive operations are indicated. They should never be resorted to in children unless there is imperative need of immediate removal of the infection, or if after months of treatment combined with minor operations for ventilation and drainage, a marked chronic empyema persists. The size of the sinuses is an important factor in determining for or against operation, and the *x*-ray plate is the guide in this respect. As a diagnostic factor, it is unreliable, as in 197 cases where blurred antra were shown, only 81 were, on culture, found to be diseased. The deleterious influence on the development of the bones of the face that may result from the destruction of these cells in young children must not be lost sight of.

Dean reports 3 cases of chronic multiple infectious arthritis very markedly relieved by extensively opening and draining the antra, ethmoids and sphenoids. These cases had all resisted months of conservative treatment and the removal of tonsils and adenoids. All of these cases showed a hemolytic streptococcus infection which, on injection into rabbits, gave multiple arthritis and death.

It has been necessary to treat or operate upon the sinuses in only a few of the large number of multiple arthritis cases studied.

**ACCESSORY SINUSES AND EYE DISORDERS.** Cushing<sup>35</sup> says that many unhappy consequences of indiscriminate and ill-advised operations on the accessory sinuses have come to his notice. He considers that supuration in the ethmoid and sphenoid cells may, in certain cases, lead to inflammatory changes in adjacent nerves, and cites, as examples, neuralgia accompanying infection of the frontal and maxillary sinuses. He disagrees, however, with Sluder's sphenopalatine ganglion neurosis theory. These processes may possibly set up similar processes in the optic nerves, but cannot possibly cause choked disk, or papilledema, a condition brought about by mechanical causes. Inflammatory processes

<sup>34</sup> Transactions of the American Laryngological Association, 1920.

<sup>35</sup> Journal of the American Medical Association, July 24, 1920.

may affect the optic nerve in such a way as to produce reddening, injection, or hyperemia of the nerve head, but, in the absence of increased intracranial tension, do not produce choked disk. Intranasal operations, supposed to be of a trifling nature, are often done to relieve this condition, with the disastrous result that meningitis follows. He has seen many cases of choked disk caused by brain tumor that had had intranasal sinus operations performed in the belief that the eye condition could in this manner be improved, and says that a retrobulbar neuritis accompanied by two or three diopters of swelling cannot be produced by infections of the nasal accessory sinuses.

Discussing Optic Neuritis associated with Disease of the Nasal Sinuses, Ellett<sup>36</sup> and Bordley<sup>37</sup> take positions much at variance to that expressed above by Cushing, and are supported in their views, in the discussion on their papers, by such eminent ophthalmologists as deSchweinitz, Francis, Posey, Gradle, Hiram Woods, and others. Ellett says that ocular disease appears to arise either by absorption of toxins from a focus of suppuration, or by contact between some pathologic process in the nose and some ocular structure. He reports 2 cases of sudden blindness caused by sinus disease where there were *choked disks* of two and three diopters respectively. In 1 case the vision cleared up promptly after exenteration of the sinuses, all of which contained pus, while in the second, although vision was not improved, the swelling of the nerve head subsided following operation.

The ocular lesion in disturbance from posterior ethmoidal and sphenoidal disease is practically always the optic tract.

Bordley found enlargement of the blind spot in only 31 per cent. of these cases and that, when present, it was caused much more frequently by acute sinusitis than by the chronic type. Central scotomas are the most important changes in the visual field, caused, according to different authors of note, by toxemia resulting from venous stasis in the optic canal; by compression of the optic nerve within the canal (perineuritis); or by disease extension through the intimately related soft tissues of the sinuses, orbit and optic canal. Most of these scotomas disappear after a properly done nasal operation, and the most prompt responses are in patients whose eyes showed the greatest changes, and which had developed with great rapidity.

Bordley also reports cases similar to those of Ellett, showing papilledema, which in one case he attributes to a profound intracranial circulatory disturbance resulting from the infected sinuses. After all, what chiefly concerns us as rhinologists, is to know that, directly or indirectly, this condition can be caused by sinus disease and that operations on the infected sinuses will relieve it.

In summing up, the author says: "Assuming that the operator is qualified, and assuming also that all other probable causes have been eliminated and that every means of diagnosis has been resorted to, I will suggest that when you are face to face with a serious optic nerve disturbance, the part of conservatism and good judgment requires an

<sup>36</sup> Journal of the American Medical Association, September 18, 1920.

<sup>37</sup> Ibid.



operative exploration of the ethmoidal and sphenoidal cells. I feel quite confident that visual disturbances are frequently the first suggestions of serious sinus disease, which may eventually lead to blindness or to death. It is only fair, then, to heed the warning and eradicate the disease before it has impaired function or destroyed life."

White<sup>38</sup> considers the Diagnosis of Loss of Vision from Accessory Sinus Disease. He divides these cases, etiologically, as follows: (1) Those due to a direct spreading of the infection to the sheath of the optic nerve, (2) those due to toxemia from infection of the sinuses, and (3) those due to hyperplasia. The latter class is often by far the most difficult to diagnose. A most careful inspection of the size and position of the middle turbinate must be made, as it will frequently be found normal anteriorly but widened posteriorly. It may be wedged in between the ethmoid wall and a deviated septum, causing some slight interference to drainage from the posterior sinuses. It is often difficult to convince the ophthalmologist, who hopes that pus will be found, that hyperplasia exists or that sufficient pressure can occur to cause atrophy of the optic nerve, but this often happens in a nose that on inspection and roentgen-ray examination showed practically nothing abnormal. It must not be forgotten, however, that pituitary disease can cause loss of vision, and plates of this region should be carefully studied in all cases. Unless some definite explanation of loss of vision can be found elsewhere, its most probable origin is in the sinuses and may be made by exclusion in certain cases. The demand for early operative intervention in cases of total loss of vision is much more imperative than when the loss is but partial, and it seems wiser to err by operating too soon, and even unnecessarily, than to expose the patient to the risk of becoming permanently blind through delay.

In all his cases, where operation was performed, the middle turbinate was removed and the posterior ethmoids resected. The sphenoid was opened in all but one case, but the anterior ethmoids, unless evidently involved, were not disturbed. Complete ethmoid exenteration does not seem to be necessary in most cases.

INTRACRANIAL COMPLICATIONS. *Frontal Lobe Abscess Originating from the Frontal Sinus.* Leegaard<sup>39</sup> uses, as a basis for a discussion of this subject, 4 cases recently seen by him, 3 of these having fatal terminations, while the fourth recovered. He restates the well-known fact that the symptomatology of the condition is obscure; much more so than otogenic abscesses of the temporosphenoidal lobe. Abscess of the frontal lobe is rather a rare condition, there having been but 87 cases reported up to 1914 according to Boenninghaus. During the last few years there have been added a number of reports of other cases, particularly in American literature.

All authors agree that the symptoms of frontal lobe abscess are not distinctive, and that therefore the diagnosis is difficult. Gerber says that "the common symptom" of frontal lobe abscess is its absence of symptoms. It is on account of this definite lack of symptoms that it is

<sup>38</sup> Journal of the American Medical Association, May 29, 1920.

<sup>39</sup> Annals of Otology, Rhinology and Laryngology, March, 1919,

difficult to differentiate the four classical stages of brain abscess; namely, the initial, the latent, the manifest and the terminal stage, although they exist here as in other abscesses. Here, as a rule, no focal symptoms are present, or, if found, do not become manifest until the abscess has become large and extended in a backward direction. Then we may find facial paralysis, strabismus, motor and amnesic aphasia.

In making the diagnosis, we must frequently be contented with the etiology of the case (a sinusitis), combined with more or less distinct signs of intracranial pressure, which demand a certain time for observation. Frequently the sinus is operated upon, and the diagnosis made later when symptoms do not disappear as expected, or when they increase in severity.

Headache is the most prominent symptom, but may be caused by the sinus infection alone or have some other origin. The localizing value is negligible. Its severity, however, is significant, exceeding that of a simple sinus infection. As the question of intracranial involvement rarely arises until after the sinus operation, the continuation of a violent headache points in the direction of an intracranial complication, and while it may be due to a meningitis, a thrombophlebitis of the cavernous sinus or an epidural abscess, these are less frequent complications even than frontal lobe abscess, and also other diagnostic signs are frequently present.

Slow pulse-rate is an important symptom but is far from constant and must not be overemphasized. Certain individuals have normally pulse-rates of 60 or lower, and the slowing may be caused by some other intercurrent affection, as in a case of the author's, where it was due to jaundice. The pulse may also be either normal or rapid, especially if the case is complicated by meningitis.

Disturbances of the sensorium are probable never absent during the manifest stage unless the size of the abscess is insignificant. Distinct drowsiness, inertness or peevishness is the rule, as also (quoted from literature) weakening of the memory and irritability (Wiener), inclination to sleep (Denker), stupor and apathy (Freudenthal), apparent stupidity (Donalies), peculiar alteration in character (Reimking).

Paralysis, twitchings or convulsions are often noted, and vomiting is very frequently observed. Dizziness has been reported, as well as chills. The temperature is often subnormal, there may be fever or it may be irregular. If fever is present, it may be due to the sinusitis or to some other intracranial complication. In some cases papilledema and optic neuritis have been described, and swelling of the eyelids is often seen, but these are in no way diagnostic, except that they are observed more frequently in cases of sinusitis complicated by brain abscess than in uncomplicated cases.

These symptoms are only those indicating some intracranial pressure of infectious origin and do not locate the abscess in the frontal lobe. The condition of the posterior plate of the frontal sinus at operation frequently gives the clue that calls for further investigation in the face of unexplained symptoms. If, on exposure, the dura appears to be normal, without bulging, it is best to wait a few days before exploring further.

The question is brought up whether it is wise to treat these abscesses in as radical a manner as those in other parts of the brain, and Leegaard, in the light of his experience, believes that it is not. These infections usually lie directly behind the sinus in the neighborhood of the primary focus and are thus easily found. It is safe to probe backward a distance of 2.5 cm. They are usually large by the time they are reached. If the dura is little changed, a thick, rather blunt needle should be used for searching, but, if marked dural changes are found, it is better to make a flap and search with a knife or a Pean forceps. Pus should be evacuated gradually and either a rubber drain, or a gauze tampon inserted only to the edge of the cavity. The opening in the dura should be small to avoid breaking adhesions which may be present. No scraping or wiping of the cavity should be attempted, and the dressings should be changed very frequently.

### TONSILS.

**Pneumococcus Tonsillitis.** A form of tonsillitis not often recognized but which is seen at times in considerable epidemics is described by Ramos.<sup>40</sup> These cases are for the most part mild, terminating in from seven to fourteen days, with slight fever at times and some glandular enlargement. There is a milky exudate on the tonsil or a white membrane somewhat similar to diphtheria. The pneumococcus is discovered in culture. This description corresponds in the main to many cases seen by me while in military service.<sup>41</sup> Our observation showed shallow ulcerations covered with a milky or translucent membrane, situated on the tonsil, faucial pillars or walls of the pharynx. Multiple points of infection are the rule and a tendency to coalescence is apparent. There is little pain, the sensation being rather a scratchy feeling, with hoarseness or aphonia when the larynx is involved. In these cases the aphonia is apt to persist for some time after the disappearance of the ulcerations. These latter are in many respects not dissimilar to mucous patches and at times a serological and microscopical diagnosis is necessary. The pneumococcus is found in pure culture, the membrane is easily removed without bleeding, there is no surrounding area of inflammation, and the disease yields to simple remedies.

**Relation to Infection.** A great deal of work has recently been done upon the comparatively new problem of focal infection, and papers studying this in relation to the tonsils and teeth particularly appear with considerable frequency.

Davis<sup>42</sup> says that an interesting point appears in connection with the distribution of lymphoid tissue in the throat and gastro-intestinal canal in relation to the bacterial flora. It is well known that lymphatics and nodes are so distributed as to protect the body against the absorption of dangerous matter from certain well-recognized sources and in fact generally speaking, only occur in those localities. In the alimentary tract two localities where striking accumulations of lymphatic tissue

<sup>40</sup> Archives Españoles de Pediatría, May, 1920.

<sup>41</sup> Annals of Otolaryngology, Rhinology and Laryngology, March, 1920.

<sup>42</sup> Journal of the American Medical Association, January 31, 1920.



appear are in the region of the throat and in the lower small intestine about the ileocecal valve and appendix. This would in itself indicate excessive absorption of dangerous material in these localities, and this indeed appears to be true, for in the throat and in the region around the ileocecal valves are found, normally, the greatest number of forms and varieties of bacteria. In the throat, the tonsils represent the greatest accumulation of lymphoid tissue and here occurs the greatest number of infections. The pathogenic organisms attack primarily the lymphoid structures or the parts which are rich in lymphoid tissue. It would appear that in many instances these organisms become adapted to grow in lymphoid tissue or in other words to attack the very mechanism which was apparently designed for protection against them. The study of the bacteriology of the tonsil shows a striking difference between the surface flora and the crypt flora. On the surface the predominating organisms were of the *Streptococcus viridans* type, while in the crypt of the same tonsil as a rule the hemolytic streptococci were found. These findings were present in tonsils removed for simple hypertrophy and with no acute infection, and it would thus appear that the crypts are an almost constant source for hemolytic streptococci and this location may be considered in a way their normal habitat. When they are present, they are usually found in all of the crypts in a tonsil. Cultures should be made not only from different crypts in the same tonsil but from both tonsils, since the bacteria may be found on one side and not on the other. The cheesy material found in tonsillar crypts is less apt to contain hemolytic streptococci than the empty crypts. It appears, however, that nearly everyone is harboring typical hemolytic streptococci in the tonsils, and that these have not been differentiated from strains which cause serious infections, pneumonia, etc.

St. Lawrence<sup>43</sup> has studied the effect of tonsillectomy on the recurrence of acute rheumatic fever and chorea, and has reached the conclusion that these conditions are definitely associated with tonsillar infection, though in a considerable number of his cases there was also infection of the teeth or alveolar process during, or just after, attacks of rheumatic fever in those from whom the tonsils have been completely removed. In his series, as a rule, the teeth received attention both before and after the operation on the tonsils, but the care was greater afterward than before. He finds that a complete tonsillectomy is necessary to attain results, for in a few of the cases a tonsillotomy alone was done, with little or no effect on recurrence, while a later tonsillectomy or complete removal put an end to the infection at once. Eighty-five children were studied who had had one or several rheumatic manifestations before the tonsils were completely removed. These were observed during the average period of three and one-half years after the operation was performed. The tonsils were markedly hypertrophic in 13 per cent. of the cases, moderately so in 69 per cent., and not enlarged in 18 per cent. They were the site of recurrent inflammation before removal in 73 per cent. "Sore-throat" recurred after removal in 7 per cent. Two opera-

<sup>43</sup> Journal of the American Medical Association, October 16, 1920.

tions were necessary before the tonsils were completely removed in 22 per cent. Tonsillar lymphatic nodes were enlarged in 100 per cent. before operation, and in 59 per cent. were not palpable afterward. After tonsillectomy there was no recurrence of attacks of rheumatic fever in 84 per cent., or of chorea in 50 per cent. There was no recurrence of myocarditis or joint pains in 77 per cent. In 58 cases of organic disease of the heart, 12 patients had suffered at least one attack of cardiac failure before the tonsils were removed, and there was but one attack in one patient afterward. He concludes that tonsillectomy (complete removal of the tonsils) is the most important measure at present available for the prevention of acute rheumatic fever and allied rheumatic manifestations.

Fontaine<sup>44</sup> gives some of the end-results of focal infection. He warns against an overzealous sacrificing of useful organs, such as the teeth and tonsils, upon mere suspicion, but, if cases are carefully considered from every angle and all other etiological factors eliminated, the prompt relief obtained from such radical measures should convince the most skeptical that it is not due to accident or coincidence. The relation of the focus of infection to the symptoms in question in this situation is dependent on: (1) the absence of any other demonstrable cause for the symptom, (2) the failure of curing symptoms by all other methods of treatment, (3) prompt and continued relief, with no return of the symptoms, with the accurate eradication of the focus of infection.

Fontaine finds the teeth to be the most common source of infection, the usual lesion being apical abscesses or granulomas at one or more roots of devitalized teeth. After removal of these teeth, the cavities left behind should be thoroughly curetted. Next in importance are the tonsils, small fibrous or submerged tonsils being quite as frequently involved as those visibly infected and greatly hypertrophied. Complete enucleation is necessary for permanent relief, in which theory he is in accord with most competent observers.

The accessory sinuses rank third in importance, the maxillary being that most frequently infected. Pain was the symptom for which relief was most usually sought and was most frequently produced by conditions about the teeth though in some cases due to diseased tonsils or sinuses. Fever, with, or without, chills, was present in a good many cases and night-sweats occasionally. The focus of infection here was about equally distributed between the teeth and the tonsils. Chronic headache was found in each case studied to be dependent on tonsillar infection and was entirely relieved by tonsillectomy. General debility, with loss of weight and strength, usually occurred in the middle aged adults, and was relieved by removal of teeth and treatment of the gums. Secondary anemia, which resisted ordinary methods of treatment, was found to be dependent upon infections of the tonsils and teeth in about equal proportion; as was also albuminuria and nephritis. He concludes that often such conditions as pain, fever, and headache, are directly traceable to focal infections, and that the most effective measure for relief or cure is complete eradication of the focus.

<sup>44</sup> Journal of the American Medical Association, June 12, 1920.

Billings, discussing this paper, reminds us that in chronic conditions the bacteria have invaded the body tissues through the blood stream, and that they remain there if the defences of the host are not sufficient to kill them. Therefore, removal of the focus in such cases will usually not greatly benefit the patient. This is, of course, necessary as a preliminary step to avoid further infection, but the resistance of the body must be built up against the invader already there. His experience in the use of antigens, in the form of dead bacteria, for this purpose has not been very satisfactory.

Thayer thinks that the treatment of these foci by surgical operations on the tonsils and sinuses is certainly justified, but that the procedures are very delicate ones and should be only done by thoroughly trained men, as the proper treatment of ethmoid disease or gravely infected tonsils is often a very serious matter. He further says that there are relatively few well trained surgeons in this special branch, which, coming from an internist, is rather disheartening.

Austin,<sup>45</sup> after a very extensive investigation of the diseased tonsils from 45 children, concludes that the occurrence of tubercle bacilli in the tonsils of children who show no clinical evidence of tuberculosis must be rare. It is of frequent occurrence to find tubercle bacilli in the tonsils where the children have tuberculous lesions elsewhere, especially in the cervical lymph glands. The 45 cases investigated were from children who had no evidence of tuberculosis, and in whom the inoculation test was positive in only one. Investigation was made from histological examination of sections and cultures in Dorset egg-medium and from direct smears. The cervical lymph glands were enlarged in 21 cases, but not in any marked or suggestive way.

Glogau<sup>46</sup> advocates a tentative tonsillo-adenoidectomy in all cases of acute suppurative otitis media, even when mastoid symptoms are well marked. While this may not result in a cure of the mastoiditis in advanced cases, he has found that in beginning cases and even in those showing moderate involvement, but with slow progress, the measure is effective. He says it is only logical that by attacking the underlying condition, the middle ear and mastoid can be drained satisfactorily by reëstablishing the patency of the Eustachian tube, thus avoiding a major operation. If the tonsils and adenoids should be removed, as they are, as a prophylactic against the development of acute conditions in the middle ear or as an aid to the cure of chronic middle-ear suppuration, it seems only reasonable to suppose that this measure will be of value in actually curing a certain percentage of acute involvements. The presence in the nasopharynx of large masses of adenoid tissue, especially with involvement and infection of the faucial tonsils, is a constant menace to the ear which can only be removed by the removal of the growth. While there are many who still regard an acute lesion as a contra-indication, he personally holds a directly opposite view and believes that the removal of the growth and the incision of the drum membrane should be done at the same time. In support of this view, he gives the following facts:

<sup>45</sup> American Journal of Diseases of Children, July, 1919.

<sup>46</sup> Laryngoscope, February, 1920.



1. The free abstraction of blood from the pharynx which always occurs during adenectomy relieves tubal congestion and assists tympanic resolution.

2. The operation of adenectomy will, in a small percentage of cases, induce an inflammatory reaction in the tympanum.

3. It seems wiser to operate in the acute stage of an existing otitis media when the ear can be safeguarded by an incision of the drum membrane. It is a well-known fact that children who have had their tonsils and adenoids thoroughly removed, rarely develop mastoiditis; while, on the other hand, in a majority of cases of mastoiditis, diseased tonsils and adenoids have been found to be present. He, therefore, proposes this operation when the discharge from the ear has not stopped within three weeks. Even if the mastoid symptoms, when present, should not disappear after the tonsils and adenoid have been removed, and mastoidectomy has to be resorted to later on, the process of healing and recovery would be much speedier and the recurrence of infection, with the necessity of repeated operation, would be avoided. Cases of mastoiditis, however, in which meningeal or septic symptoms are present and those showing *Streptococcus capsulatus* as the causative germ, and also those cases of mastoiditis which complicate infectious diseases or where there is distinct necrosis of the bone, are excluded from this conservative procedure. In these cases the mastoid operation must be performed immediately. The so-called classical mastoid symptoms form, *per se*, no contra-indication for tentative tonsillo-adenoidectomy. His investigations have only been conducted in children under eight years of age, but he believes that the same measure applied to adults will be satisfactory. The reason that mastoiditis develops in so many cases in which the middle ear is apparently draining well through the drum membrane is because the underlying condition which produces the pus remains unabolished, and we simply drain off the overflow. Myringotomy at its best is but a substitute for the natural drainage through the Eustachian tube. It is obvious that cases of complicated mastoiditis, which show signs of labyrinth involvement or meningitis, will not be improved by this procedure, and it is not claimed that every case of even mild mastoiditis will be cured thus. It is thought, however, that it gives the patient a possible chance to have a major operation substituted by a minor interference. In any case, the mastoid should be carefully watched to see whether the process will retrogress.

While many men favored *local anesthesia for tonsillectomy* previous to the War, the number of them now advocating this measure is greatly increased, as in most army hospitals local anesthesia only was used. A number of papers have appeared giving the technic for local anesthesia, in all of which much the same method is advocated.

Vail<sup>47</sup> reports on 505 tonsillectomies under *local analgesia* done at the League Island Navy Yard. These were all done upon men who it was felt were subject to acute diseases and who would offer a better probability of standing up under conditions of exposure, dampness,

<sup>47</sup> U. S. Naval Medical Bulletin, April, 1920.

fatigue, etc., if their tonsils were removed. Vail paints the anterior and posterior pillars, posterior pharyngeal wall and the uvula twice at intervals of two or three minutes with a 10 per cent. solution of cocaine. In a few patients he uses  $\frac{1}{100}$  grain of hyoscine hydrobromide under the tip of the tongue twenty minute before operation. In 400 cases he used a solution of cocaine,  $\frac{1}{2}$  to 1 per cent., with one drop of adrenalin, 1 to 1000, to the dram. A total of 3 to  $3\frac{1}{2}$  drams was injected. In 30 cases a solution of 0.1 per cent. of cocaine was used, and in 65 cases procaine in  $\frac{1}{2}$  to 1 per cent. strength. Vail much prefers the stronger cocaine solution, as when the weaker solution was used it was necessary to inject more, and in a few cases some infection occurred, as he thinks, from the deep injection. Of the 400 cases in whom 0.5 per cent. cocaine was used, 2 showed toxic symptoms. These were consecutive cases, and the solution had been made up several days previously. Uneventful recoveries were made. Vail uses the snare eversion method which has been described in these columns before, and which is being used by an increasingly large number of men. Three of his cases developed infection and in two external evacuation was necessary. Eight cases were operated upon during an attack of acute follicular tonsillitis with fever, and all showed a drop of temperature to nearly normal within twelve hours after the removal of the infected tonsils and made quick recoveries. Edema of the uvula, as usual, was seen fairly frequently. This is most often seen in the type of uvula that is long, and suggests amputation at the time of the tonsil operation, or if the tonsils have extended high up and close to the uvula so that lymphatic drainage is interfered with. When this condition occurs, the writer amputates a moderate amount of the mucous membrane with a pair of scissors and finds that within one-half hour the edema will have very largely drained out by gravity. There is no discomfort felt at the time of the amputation.

Coates and Raskin,<sup>48</sup> in a report of their service at Camp Hancock, Georgia, used the same technic of eversion and found it entirely satisfactory in a large number of cases. Although Vail reported several cases of hemorrhage, one or two alarming, these authors had no primary or secondary hemorrhage and no complications of any kind, and they feel sure that the period of convalescence is as materially lessened by the use of this method as the operating time is undoubtedly shortened. The preoperative technic consists in a thorough examination of the patient the night before operation. Before coming to the clinic, the soldier shaved, bathed and brushed his teeth. Upon reaching the operating room, he was instructed to wash his face and hands with soap and water and then with a weak solution of bicloride of mercury or alcohol. A sterile gown was put on and the patient was seated on a white enamel operating chair with sterile muslin slips to cover the chair arms. The head was covered with a sterile towel and a sterile sheet draped over the gown. Instead of the hyoscine advocated by Vail, morphine and atropine were administered hypodermically twenty

<sup>48</sup> New York Medical Journal, January 17, 1920.

minutes before beginning to operate. A slow, gentle application of 10 per cent. cocaine was made to the throat in the same manner as described above except that a cotton-wrapped, curved applicator dipped in cocaine solution was inserted between the bases of the tonsil and the tongue, and, with the lips closed, allowed to remain there for several minutes, thus anesthetizing the lower pole. The anesthetic was injected after painting with a  $3\frac{1}{2}$  per cent. solution of tincture of iodine, and consisted of 0.1 per cent. cocaine, 1 per cent. novocaine, or a 1 per cent apothesine solution. Several drams were injected back of each tonsil after raising the anterior pillar with a straight needle and following the capsule back to its deepest part.

Gill<sup>49</sup> feels that, by the use of local anesthesia, the patient is not subjected to the risk of contracting an ether or septic pneumonia, and that the shock following operation is much less. He also gives his patient a hypodermic of morphine twenty minutes before operation, and uses 1 per cent. procain with adrenalin for anesthetization, four drams being sufficient for both tonsils. He also uses the long straight needle, but, whereas Coates and Raskin made but one injection for each tonsil, going immediately to the outermost portion of the capsule, Gill makes one injection between the posterior pillar and the tonsil, one at the superior pole of the tonsil, one at the base of the tonsil and one between the anterior pillar and the tonsil, care being exercised not to injure the pillars. He also uses a modified eversion, but separates his pillars from the tonsil first. This author condemns strongly the so-called bloodless tonsil operation, which is done by seizing every oozing point with an artery clamp, and says this procedure is not necessary to control hemorrhage and besides causes unnecessary traumatism of the throat and always leaves a scar. Hemorrhage, with his technic, is slight, but, if any is present, it is controlled by making gentle pressure with a very soft sponge, leaving the sponge in the fossa for three minutes, which is the time required for blood to coagulate.

Patton<sup>50</sup> anesthetizes his tonsils with only one or two punctures, going immediately *through* the tonsil to the back of the capsule. He has had excellent anesthesia in all cases thus injected, and has never had any deep infections. Frequently only a few drops of solution are necessary to give good anesthesia, as I myself can testify, having had my tonsils removed in this manner. It is also true that there is a lack of edema and postoperative reaction following which is sometimes seen where the anesthesia is largely caused by the pressure of large quantities of solution. I have, however, seen one fatal case of neck infection develop where this method was used, although it may not have been due to the fact that injection was made through tonsil tissue.

Becker<sup>51</sup> most strongly condemns the use of local anesthesia for tonsillectomy, saying that it seems to have been a "sort of pleasant past-time to remove the tonsils of the boys of the Army at some of the cantonments" and that he understands it was usually done under

<sup>49</sup> Laryngoscope, December, 1919.

<sup>50</sup> Transactions Southern Medical Association, November, 1919.

<sup>51</sup> Pennsylvania Medical Journal, February, 1920.



"local anesthesia that did not anesthetize." He claims to have seen many bad results following this practice. His dislike for local anesthesia is based on a fatal case of his own. Two sisters came to the hospital together for removal of tonsils. The same solution of anesthesia was used for both, being 1 per cent. novocain. A small amount only was injected and the second sister died, while the first one showed no symptoms whatever. He says that there was no possibility of error in the solution administered to the second patient. Becker believes that in general anesthesia for tonsillectomy there is less hemorrhage, mental or surgical shock, muscular traumatism, trauma of bloodvessels and nerves and that the removal of both tonsils and adenoids can be made more surely complete without resulting adherence of the pillars or scar tissue, and also that the anesthesia is much safer. Most of us will agree with him that when it comes to removing an adenoid mass in addition to the faucial tonsil, general anesthesia is to be preferred, but few of us will agree with all the points just mentioned.

Several years ago the profession was considerably stirred over the report of cases by Richardson, Manges, and others, of *Abscess of the Lung Following Tonsillectomy*, and this subject was discussed in PROGRESSIVE MEDICINE for March, 1917 and 1918. Since that time other reports have appeared and numerous conjectures have been made as to the cause of this untoward result.

Clendenning<sup>52</sup> says that such cases will occur fairly frequently in the practice of every man who pays especial attention to chest disease and that within the last few years their presence has been more particularly noticeable.

Manges said, in 1916, that abscess of the lung should never occur if the patient has been properly treated and that it never occurs after tonsillectomy in private practice. In this Clendenning entirely disagrees, since in 1 case studied by Clendenning the symptoms of lung abscess began immediately after the operation, and it is believed that the motor-driven anesthesia apparatus used in tonsil operations may be responsible for the inspiration of septic material causing infection. He does not refer to the suction feature of these machines but to the motor which forces the ether vapor into the pharynx. This vapor is, he says, forced into the posterior pharynx under what is really a very high pressure which blows out the posterior space and is sufficient to cause an air current that will force pus infection, blood clots or infected pieces of tissue past the glottis into the lung. As the pressure is continuous, it impedes coughing and, even with the head low, infected material may be forced upward through the larynx. In those cases where such an apparatus was not used, he turns for an explanation to a supposed relationship between the tonsil and the lung, believing that there may be a definite path of infection directly from the tonsil to the lung by way of the lymph glands. He thinks that meddling with the tonsillar fossæ after operation in the endeavor to stop slight oozing of blood may result in infection being driven into the bloodvessels. In conclusion, he states

<sup>52</sup> Journal of the American Medical Association, April 3, 1920.

that lung abscess is at present a frequent sequel to tonsillectomy in private practice as well as in free services. It is sometimes fatal, always serious, and often very crippling. Since it is due in some cases to inspiration of infected material, motor driven anesthesia apparatus should be discontinued, and all swabbing or tampering with the throat after enucleation should cease.

This paper brought out strong protests from a number of laryngologists who ridiculed Clendenning's theories.

In the first place, Simpson and Noah<sup>53</sup> report 2 cases of lung abscess following tonsillectomy under *local anesthesia* in which the possibility of aspiration of infected material could be absolutely denied. These writers believe that since aspiration could not have caused these lung abscesses, they must have been due to hematogenous infection. Both cases were operated on under local anesthesia in the upright position. The mouths and throats were in a septic condition before and for sometime after operation. In one there was considerable sloughing and the late occurrence of the symptoms (eleventh and twelfth days) point to a blood-stream infection.

Wilkinson<sup>54</sup> says that under no circumstances does the pressure anesthesia apparatus produce the pressure in the posterior pharynx as claimed by Clendenning. In his practice, as in that of most others who use this method, the ether enters the mouth through a curved cannula and is thrown against the buccal wall external to the molar teeth and from there the current is more upward than from the posterior pharyngeal wall to the glottis. A piece of cotton held in the back of the throat will demonstrate which way the current of air flows and that there is no force of vapor into the larynx. He also disagrees with the theory of the direct relation between the tonsil and the lung as he says a cavity lies between the two portions of the pleura across which direct infection cannot pass without previous inflammation and adhesion of the walls of the pleura. He states that in a series of more than one thousand cases not so much as even a bronchitis developed after operation and thinks that if such a path of infection existed more such cases would be seen.

Flagg<sup>55</sup> also objects strongly to Clendenning's views and he agrees with Wilkinson in all respects. He believes that delivery of the ether vapor intranasally through a catheter which terminates below the base of the tongue is the best way to avoid pulmonary infection. The ether is then delivered behind and below the tonsil, and subsequent hemorrhage is blown into the mouth and away from the larynx.

Fishman,<sup>56</sup> discussing Peter's paper, believes the cause of these abscesses to be a thrombus in one of the veins of the tonsillar area which may be highly septic or sterile, and from this an embolus occurs in the blood-stream which lands in the lung tissue. These may cause no symptoms or very slight symptoms, or they may be so large that an abscess occurs due to necrosis without infection or to an infectious

<sup>53</sup> Pennsylvania Medical Journal, March, 1920.

<sup>54</sup> Journal of the American Medical Association, April 24, 1920.

<sup>55</sup> Ibid.

<sup>56</sup> Ibid., October 16, 1920.

process on top of the necrosis. In the cases he has seen, he found most such results followed a rapid method of operation, possibly because there was more damage to the tissues and the chance for septic thrombi to occur was greater.

It is strange that in many large hospitals where a thousand or more tonsillectomies are done yearly, no cases of subsequent lung abscesses have ever been seen. Critics say that it is because they have not been looked for but if they occurred with the frequency that some writers claim they could hardly be thus overlooked.

The results of tonsillectomies are always of the utmost importance, and in *PROGRESSIVE MEDICINE*, March, 1917, the views of Hudson-Makuen and Kenyon were given in regard to Impairment of Voice Following Deformities Caused by the Tonsil Operation.

Masland<sup>57</sup> has studied a large number of cases postoperatively with a view to tabulating the end-results, and thinks that too energetic surgery in this region is causing considerable criticism. He finds only 2 per cent. of cases free from deformity of the palate or pillars after operation and that while a large proportion of cases are relieved from the symptoms for which they were subjected to operation, a great many still complain of various discomforts in the throat or defects in the speaking or singing voice.

Masland advocates leaving the capsule of the tonsil in place, even retaining a shallow layer of tonsil within it. The remaining crypts are shallow and usually return to health, while the absence of scar tissue greatly enhances the operative results.

In 1917 and in 1918 *PROGRESSIVE MEDICINE*, the work of French on the *Transillumination of the Tonsil* was noted in detail, but through some mistake his color code was not reproduced. A revised and simplified code is given, therefore, in this issue. French<sup>58</sup> has followed his study of the pathology of the tonsil by transillumination, with an extensive work on the chain of lymph nodes which lie between the tonsil and the base of the tongue, using his tonsilloscope to determine whether or not they are pathological. It was found that these lymphoid structures, which often appear to be part of the inferior lobe of the tonsils but which really lie below them, were frequent harborers of infection. He found that upon the lateral walls of the laryngopharynx and the base of the tongue, between the tonsils and the level of the epiglottis, there is a broad field of disordered lymphoid tissue. These infratonsillar nodules are found to have distinct capsules and they can be shelled out of their beds with a snare or with a tonsillotome without excessive bleeding and should be removed whenever they are hypertrophied or infected. Such a diagnosis should be made as consistently as in the case of the tonsil above them, since obliteration of infection in the faucial tonsil will not allay symptoms when infected nodules remain below. French finds that these nodules are really of a piece with the tonsils, as their underlying capsules are a continuation of the capsules of the faucial tonsils. The mucous membrane covering the nodules is

<sup>57</sup> New York Medical Journal, August 16, 1919.

<sup>58</sup> Ibid., June 19, 1920.



attached to the lower edges of the inferior poles of the tonsils, but the loosely attached ends of the lymphoid bodies extend forward to the

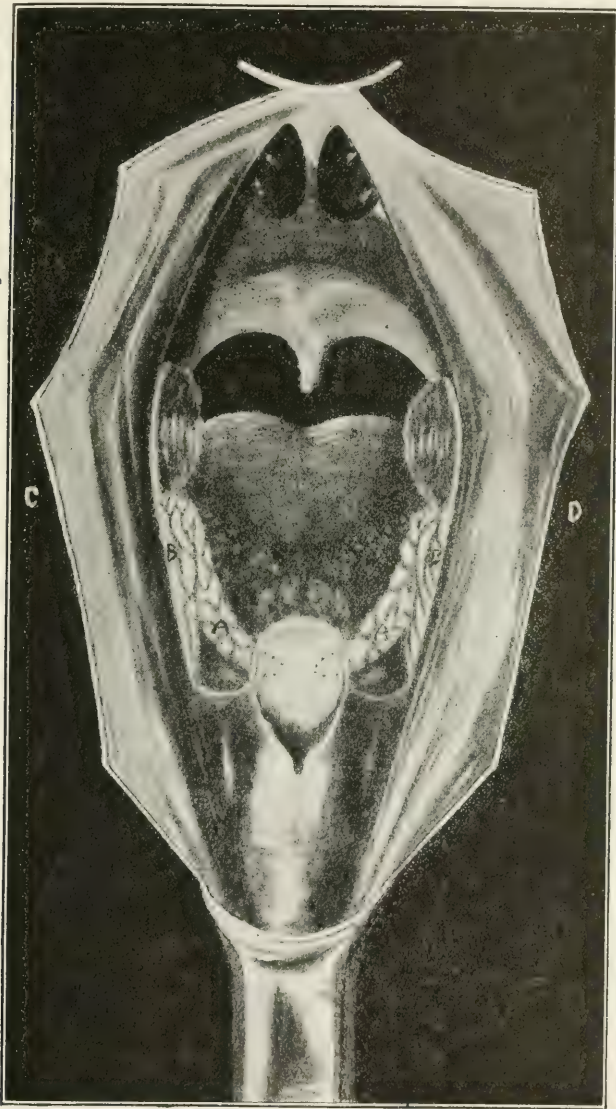


FIG. 44.—Diagrammatic drawing of the pharynx, with fully developed nodules of adults, as it would appear if laid open and viewed from the back of the neck. *AA* are the lingual and *BB* the pharyngeal branches of the infratonsillar nodules. On the side of drawing marked *C* the upper ends of the branches are seen to be blended into a common trunk. The trunks have common capsules which with the capsules of the branches are continuous with the capsules of the faucial tonsils. The looped lines on the side of drawing marked *D* show the varied lengths of complete pharyngeal nodules removed from children and youths before the trunks and lingual branches were developed. The dotted lines on the epiglottis indicate the positions of the free ends of the lingual branches on the base of the tongue just above the glosso-epiglottic fossæ. (French.)

posterior lateral halves of the inferior lateral lobes. These are the structures which commonly hypertrophy after a tonsillectomy and appear in the tonsillar fossæ, being spoken of as recurrent tonsils. They have been known to some of us for a long time as the lingual folds of the tonsils. They contain crypts and are at times the cause of localized

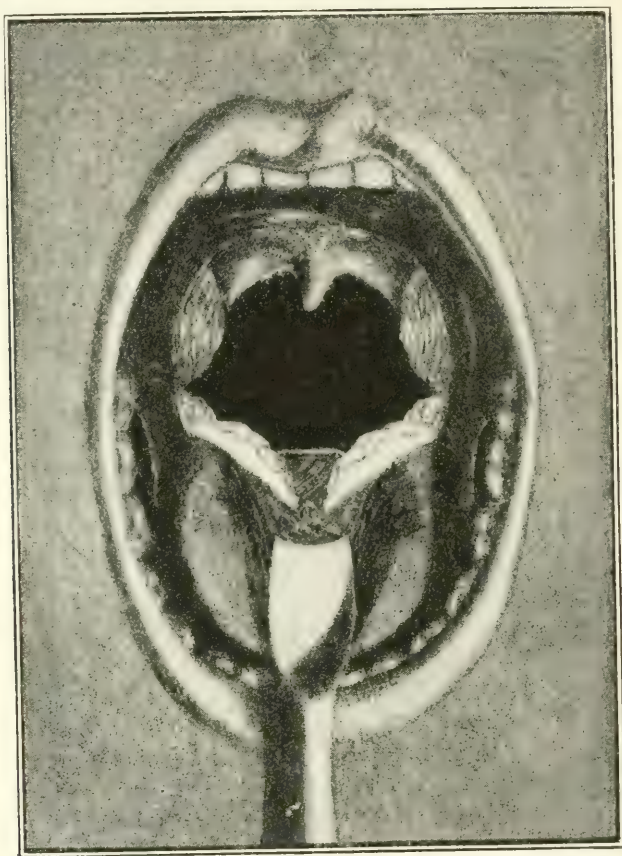


FIG. 45.—Direct view of the whole of the lingual and the upper ends of the pharyngeal branches of the infratonsillar nodules obtained by deep depression of the base of the tongue. As in Fig. 44, their upper, or outer, extremities are seen to be connected with the inferior poles of the faucial tonsils—their lower, or inner, extremities to lie directly in front of the epiglottis. The branches extend backward as well as inward and are, therefore, longer than they appear to be in the sketch. With soft yielding tongues and moderately tolerant fauces this expose is very easy of accomplishment. (French.)

sore-throat from a minute acute septic process in one or more of the crypts, and fully developed nodules are to be found in varying length and thickness in all subjects of any age above six years who possess tonsils which are in any degree diseased. At times they become very large. The illustrations given describe the anatomy. The lingual branches are apparently developed in youth, and then only in patients with exten-

sively diseased tonsils. The nodules, when equally developed, may measure from one-quarter to one-half of an inch in width and thickness. In children, their width and thickness are likely to vary between  $\frac{1}{8}$  and  $\frac{3}{8}$  of an inch. In children, the nodules are smooth, round-topped, elongated eminences of lymphoid tissue which are rather firm to the touch. Later in life the surface has become irregular, until in adult life they are thrown into numerous folds or flat convolutions. The lingual branches, when well developed, are as soft as adenoid growths. French's observations lead him to believe that the lingual tonsil is far less frequently enlarged than the nodules which connect it with the faucial tonsils, and, when it is enlarged, it is very much less so than the nodules themselves. It seems to be a fact that when the lingual tonsil is enlarged and the associated nodules are connected with pus-tonsils, the nodules are likely to be several times larger than the lingual tonsil. He believes that the free ends of the lingual branch of the nodules are much more often the cause of pressure cough in adults than is the

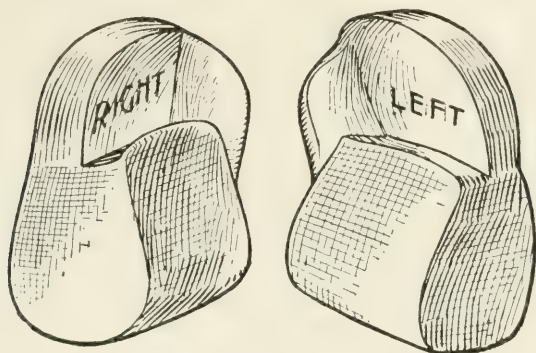


FIG. 46.—The black molds. (French.)

lingual tonsil which is usually credited with it. Scattering over the upper surface of the nodules, there may be anywhere from 125 to 150 crypts, at least half of which are retention crypts. Some of the crypts are wide-mouthed and shallow, and are manifestly incapable of retaining foreign material, but many of the valves are straight or crescent-shaped slits with their lids in apposition and the crypts into which they open are often found filled with infectious material. Some of these are very small, but often their contents can be seen protruding from their mouths and can be easily dislodged with a gentle touch of the curette. This fact suggests the probability that various crypts become ripe from over-distention and evacuate themselves. The surrounding tissues are usually hyperemic from the irritation thus caused. The infected débris in the crypts of the nodules of some adult subjects probably amounts to a quantitative equivalent of the infective débris in extensively diseased tonsils and the pathogenic organisms isolated are practically the same in each. Such are the *Streptococcus hemolyticus*, *Streptococcus viridans*, and the *Staphylococcus aureus*. These nodules should



certainly be classed as tonsils since they are really but off-shoots or branches of the faucial tonsils and are infected in the same manner. French uses the tongue depressor and a single tonsilloscopic lamp for diagnosis. It is necessary to push the posterior portion of the tongue well to one side to clear a visual pathway to the part of the pharynx containing the nodules. The tonsil lamp is then made to slide along behind the ridges of tissue to produce in its passage a luminous display of the pathological conditions in every part of them. He says that with the glowing window of the lamp pressed firmly against it, the nodule is, so to speak, cornered and will "instantly proclaim its depth of guilt by the depth of its blush." If the diseased condition of the *tonsil* is extensive enough to give a uniform bright rose shade of color, it is a fair assumption that, in a subject above the age of six years, filled retention crypts are present in its annexed nodules. To enucleate these masses, French uses a specially made block which fits snugly under the angle and lower edge of the jaw on the outside and is held in place by the anesthetist, for counter pressure. After the block mould is in place, the forefinger of the free hand of the operator is introduced into the fauces to press the tonsil outward and downward upon the nodule to be removed. The Sluder guillotine, with the flat surface of the shaft in a horizontal position, is then introduced obliquely into the mouth and dipped gently downward over the side of the base of the tongue, close to the end of the forefinger pressing upon the tonsil, until the arc meets with the resistance of the lateral pharyngo-epiglottic fold. The edge of the shaft is then pressed forward deeply into the base of the tongue as near its outer limit as possible. The arc is now pressed outward with moderate firmness in order to sink it into the tissues below the free end of the nodule, and, while maintaining the pressure of the shaft against the tongue, the arc is drawn slowly upward along the block-supported wall toward the finger pressing upon the tonsil. Upon reaching the inferior pole, the upward movement of the arc is checked, and at the same instant it is pressed hard against the ramus of the jaw to maintain its hold upon the stretched mucous membrane of the lateral wall of the pharynx. That membrane is highly elastic, and is drawn under the nodule in ridges, like the wake of a moving hull, and put under considerable strain as the lower end of the nodule is doubled under itself by the arc. The finger holding the tonsil is then slipped down to the dislocated nodule overhanging the arc, to manipulate it into the grip of the blade of the guillotine—when, after a half minute of compression, it is cut off and the guillotine withdrawn.

A pharyngeal nodule is removed after a tonsillectomy—the block mould being in position outside the neck—by a scoop of the arc of the guillotine upward against a resisting finger held in the lower part of the empty tonsillar fossa, where it also may be made to assist in manipulating the dislocated tissues into the grip of the blade.

If it is not desired to remove the nodules, the crypts may be opened and curetted. Little or no hemorrhage is to be expected.

**Hemorrhage.** Hemorrhage more concerns the laryngologist than the worker in any other field of surgery, since he operates for the most part

in cavities difficult of access and often surrounded by bony walls where it is impossible to practice ligation. Control of bleeding must then often be secured by packing, annoying and dangerous in itself, or, in desperate emergency, by the ligation of main blood trunks. Tonsillar hemorrhage, for a long time the *bête noir* of the throat surgeon, is no longer feared as it was fifteen years ago, many methods having been devised for its prevention and control, though it will, in all probability, be an ever-present source of anxiety to the operator at times. Hemophilic Type Hemorrhage is reported by Hayden<sup>59</sup> and attention called to the usefulness of transfusion in these cases. While many cases of delayed or prolonged clotting-time are described as having hemophilia, it is in reality a rare disease, usually found in the males of certain families although transmitted through the females. In these cases, whether true hemophilia or not, the type of hemorrhage is the same, namely, a slow capillary oozing after all mechanical means for hemostasis have failed and where the blood clotting period is abnormally long. The case reported is of interest and suggestive at least. A married man without family or personal history of bleeding was operated upon under ether for deflected septum and infected tonsils. Slow hemorrhage began from the nose within half an hour, and continued at the rate of twenty-five or more drops a minute for twenty-four hours in spite of packing, hemostatics, horse serum, etc. Clotting time was fifty minutes. One hundred c.c. of blood was transfused from the patient's sister, who was mistaken for his sister-in-law, at the fifteenth hour without any effect, but a second transfusion at the twenty-fourth hour having been made from the real sister-in-law, the bleeding stopped completely within five minutes and coagulation time was decreased to five minutes. Modern methods and technic render the operation of transfusion so simple and safe that it should be used in serious cases of hemorrhage, even though true hemophilia be not the cause.

An editorial in the *Journal of the American Medical Association*, July 3, 1920, quotes Tait<sup>60</sup> on the natural arrest of hemorrhage from wounded bloodvessels. One indispensable factor in coagulation is the formation of the insoluble protein fibrin from an antecedent fibrinogen existing in solution in the plasma. Fibrin ferment is also generally admitted to be an essential agent, not present in the circulating blood but formed when it leaves the vessels. Contact of shed blood with ordinary foreign substances is sufficient to induce clotting, but the plasma fails to clot rapidly when brought into contact with clean, smooth surfaces, especially if greasy. Tait concludes that the blood contributes in two ways to the arrest of hemorrhage: First, certain of the cells agglutinate at the cut end of the vessel to form a plug; second, the plasma undergoes coagulation. The way in which non-greasy foreign matters induce coagulation is by affording a suitable physical surface to which the labile platelets or thigmocytes (spindle cells) can adhere. These adhesive cells are highly phagocytic toward particles of non-greasy matter; they make an undue effort to ingest the foreign material,

<sup>59</sup> *Annals of Otology, Rhinology and Laryngology*, March, 1920.

<sup>60</sup> *Proc. Physiol. Soc.*, June 7, 1919, *Jour. Physiol.*, September 5, 1919.

stretch and allow thrombin to exude, thus causing clotting. Thus blood confined within smooth surfaces fails to clot because the cells remain intact and no thrombin exudes. The thigmocyte remains unaltered when anticoagulants, such as citrates, are added to the blood. If this hypothesis is correct, hemorrhage is primarily arrested by the adhesion of labile cells in the form of an agglutinin which plugs the vessel, the plug being added to by acquired adhesiveness to other unaltered cells of the same kind, and the same cell which is assumed to furnish thrombin by cytolysis and thus cause clotting of the plasma is likewise responsible for the formation of the plug, thus contributing in more than one way to the arrest of hemorrhage.

Dabney<sup>61</sup> reports 4 cases of secondary hemorrhage following tonsil operations where the bleeding was delayed from the second day to the sixth, to the seventh and to the tenth day respectively. No cause is assigned for these delayed hemorrhages other than the possible separation of a slough, thus exposing a bloodvessel end. In 1 case a tear of the posterior pillar was discovered and clamped; in 1, ice controlled the bleeding; and in 1 the fossa had to be packed for over twenty-four hours. Two of the cases were done with local anesthesia and 2 under ether narcosis, so that the anesthetic does not seem to have played an important role in their production.

### THE LARYNX.

**Acromegaly.** Jackson<sup>62</sup> reports laryngeal findings in 4 cases of acromegaly and concludes that the larynx is probably frequently involved, and should be examined in every case of hypophyseal abnormality. The characteristic overgrowth of these cases at times involves the laryngeal cartilages and soft parts, and may produce stenosis sufficient to require tracheotomy, the dyspnea being increased by impairment of the glottic movements resulting in a defective bechic cycle. In only 1 of the 4 cases was the laryngeal mucosa involved, and in this it was probably a coincidence. In several of the cases in which the larynx seemed symmetrical by external palpation, the laryngeal image was not found to be so. Where there is apparently hyperplasia of the larynx, acromegalic overgrowth should always be considered as a possible cause.

Hoarseness caused by laryngeal paresis, with symptoms simulating acute pulmonary tuberculosis, has been reported by Myers<sup>63</sup> as due to an infection of the nasal accessory sinuses. He bases his conclusions on the strength of one case only, but in this case were found the usual symptoms of pulmonary tuberculosis, rapid loss of weight, persistent cough, night-sweats, daily rise of temperature, occasional rigors, anorexia, insomnia and aphonia. The laryngeal examination showed that the cords abducted normally, but, on attempting to phonate, they did not approximate in the center so that a diagnosis of thyroarytenoid interni

<sup>61</sup> Transactions of the American Laryngological Association, 1920.

<sup>62</sup> Journal of the American Medical Association, 1918, lxxi, 1787.

<sup>63</sup> Laryngoscope, December, 1919.



paralysis was made. Eventually, pus was found by suction in the sphenoid and posterior ethmoid sinuses. Medication to the larynx was withheld while the nose was being treated, and the laryngeal paralysis quickly disappeared.

**Laryngeal Edema.** Edema of the epiglottic folds and epiglottis is very frequently seen accompanying the severer types of inflammation of the pharyngeal mucous membrane, as well as the cellulitis or abscess formations which occur in direct proximity to it. On the other hand, large accumulations of pus in the deeper tissue of the neck in certain situations give little or no edema, as in retropharyngeal abscess. Peritonsillar abscesses, however, frequently cause edema of moderate degree, usually limited to the involved side.

Coakley<sup>64</sup> contributes to the classification of this cause for edema and says that there are three types, clinically, of peritonsillar abscess; in one, the greatest accumulation of pus is external to and above the middle of the tonsil, and there is but little edema or infiltration on the side wall of the pharynx, or in the corresponding aryepiglottic fold. In the second type, where there is marked infiltration of the posterior pillar, the pus burrows downward along the side wall of the pharynx behind the tonsils. Here we find much more extensive edema and infiltration on the side wall of the pharynx, and correspondingly a marked unilateral edema of the aryepiglottic fold, at times almost completely blocking the visible pathway of air to the larynx.

The third type, less common than the second, is a formation of an abscess external to the tonsil, with a tendency to extend anteriorly to the side wall of the pharynx, and this is accompanied by a considerable edema of the aryepiglottic fold on the same side. Incisions which fail to reach the abscess cavity, either because performed too early or because of an improper direction, frequently open up paths of infection resulting in the spread of the infection along the lymphatics on the side wall of the neck and produce a cellulitis under the deep fascia which may require an external operation. Laryngeal edema is usually found to be even greater in these cases than in the strictly peritonsillar abscesses. The author believes that the presence of a deep-seated swelling beneath the angle of the jaw, accompanied by an increasing edema of the arytenoids on the same side, is best and most surely relieved by an external incision, and these incisions should be made under local anesthesia on account of the great danger of giving a general anesthetic. Abscesses in the pyriform fossa and in the glosso-epiglottic fossa are accompanied by considerable laryngeal edema. The region is best inspected by means of the Jackson pharyngeal speculum, and one may thus often see a yellow area in the red swollen edematous tissue indicating the formation of pus. When this is found, it should be evacuated with either a straight or suitably curved knife. If the abscess cannot be located, it is thought to be poor technic to stab the edematous tissue indiscriminately. Ice should be depended upon to relieve the edema, and the case kept under close observation, with preparations for tracheotomy ready at hand.

<sup>64</sup> Laryngoscope, February, 1920.

**Web Stenosis of the Larynx.** Lynah<sup>65</sup> goes into great detail in the treatment of these cicatricial stenoses. They are one of the most frequent causes of inability to permanently detubate and decannulate patients suffering from chronic laryngeal and tracheal stenosis following diphtheria. Injuries to the larynx, operations for the removal of laryngeal papilloma, and plastic operations on the larynx and trachea are also causes. The stenosis is frequently located in the upper portion of the larynx and involves the ventricular bands, leaving only a small opening for respiration in the posterior portion between the arytenoid eminences. In other cases, the web stenosis may be subglottic or deeply located in the region of the cricoid cartilage, or even at the tracheal fistula. The most frequent location of these webs is in the region of the cricoid cartilage well below the vocal cords. They are frequently imperforate when of long duration and tracheotomy has been performed in the attempt to dispense with the intubation tube in post-diphtheric stenosis. Even when there is only 1 mm. lumen for laryngeal respiration above the cannula, the vocal cords are often normal, the children possessing remarkably good voices, as soon as the subglottic cicatrix is severed. Arytenoid motion is always good, even when there is complete imperforate stenosis allowing no air to enter the larynx. This can be noted on the introduction of the laryngeal spatula when the patient gags, and it is probably kept up constantly by the acts of deglutition. Treatment of these web stenoses is by endolaryngeal and retrograde bouginage and by repeated applications of the galvanocautery. If the web is very thick and imperforate, it may be severed with a knife, the cutting edge of which is turned in the anterior direction. If it is thin, gentle pressure with a small bougie will usually open it. The tip of the bougie should be directed ventrically to avoid a false passage into the esophagus. As soon as the web is incised by the knife or cautery, a small intubation tube or soft rubber laryngeal tube is introduced to keep the edges from fusing. When the web is not imperforate, it may be gradually dilated by bougies until the lumen is of sufficient size to admit the galvanocautery knife, and further bouginage keeps the lumen well open. There is no tendency to close after bouginage is once started, the lumen of the tube remaining the same size as at the last treatment. But on the other hand, there is no tendency for the lumen to increase without the mechanical divulsion. These cases are usually treated once a week. Where there is a complete cicatricial web stenosis, with fusing of the cords, bouginage, performed with great care, will open the larynx, and a soft rubber laryngeal tube will keep the lumen open. After that, the treatment is the same as previously mentioned.

**Tuberculosis of the Larynx.** Mullen<sup>66</sup> calls attention to the indifference of laryngologists toward tuberculous laryngitis and deplores this attitude. He feels that a much more active interest should be taken in this disease, and that there is a great deal more of it in existence than laryngologists seem to think. This is simply because they are not

<sup>65</sup> Laryngoscope, June, 1920.

<sup>66</sup> Journal of the American Medical Association, July 31, 1920.

making the diagnosis, possibly from fear of becoming infected themselves while examining or treating this condition. Carmody, in discussing this paper, makes light of this fear saying that there is little such danger since everyone has probably had tuberculosis in some form or other and been cured. He agrees with Mullen that the best efforts are directed toward treatment of the early stages and the prevention of ulceration, and that much can be done to prevent the breaking down of the tissues. Mullen is impressed with the fact that the disease is always more extensive than it appears to be when seen in the laryngeal mirror. Many of these cases seeking recovery from tuberculosis of the throat go from physician to physician or dispensary, whereas they should be in bed carrying out an absolute rest-cure. Many sanatoria do not admit known cases of laryngeal tuberculosis, which complicates the problem of treatment. All laryngologists should undoubtedly be interested in this question, since much may be done to alleviate, if not to cure, this terrible malady. Laryngologists should make themselves familiar with the diagnosis, and a great deal of attention should be paid toward teaching this to postgraduates. The diagnosis is difficult at times, but Welty feels that, with stereoscopic plates, the x-ray will show, in most cases, densities corresponding to the lesions in the lungs as well as ulcerations of the epiglottis and other structures.

St. Clair Thomson<sup>67</sup> is in accord with Mullen in these views. He has studied the question of the Prognostic Importance of Tuberculosis of the Larynx, which is of interest since statistics would tend to demonstrate that the death-rate has not only ceased the steady decline which it has pursued for many years but has been steadily rising since 1912. Every case of pulmonary tuberculosis, or every suspected case, should be examined by a skilful laryngologist, not once only, but at regularly recurring periods, and every tuberculosis sanitarium should have a laryngologist on its regular staff. Mullen found, in a questionnaire sent to many hospitals and sanatoria, that comparatively few of these had such a staff official and that the laryngeal examinations, when made at all, were usually made by the internist. Thomson says that tuberculosis can be diagnosed in a few cases in the larynx before it has sufficiently advanced elsewhere to give any physical signs. He finds that among all fairly early cases of pulmonary tuberculosis admitted to a sanitarium, the expectation is that 60 per cent. of them will be alive for from three to seven years. In a similar class of cases with the larynx involved in addition, only 30 per cent. will be alive at the end of the same period. Even in a slight and early case of pulmonary tuberculosis, the detection of a laryngeal lesion makes the prognosis more gloomy than in a case of advanced pulmonary tuberculosis with a free larynx. A skilled examination of the larynx will, therefore, aid greatly in forming the prognosis of the case in all stages of pulmonary tuberculosis. In regard to diagnosis, he says that the chief thing is the skilled eye of the diagnostician, because it is almost impossible to put down in words all conditions that are seen. Constant practice, therefore, in clinics where large

<sup>67</sup> *Annals of Otology, Rhinology and Laryngology*, December, 1919.



numbers of these cases come, is essential for training. Pallor, however, is a suggestive thing, whether pallor of the soft palate or epiglottis and larynx generally, though congestion in elderly subjects may be met with. The symmetry of the larynx is of importance, since if there is a congestion, or a catarrh, or thickening, as in syphilitic infiltration, it is likely to be evenly deposited on both sides, while tuberculosis is frequently much more prominent on one side than on the other. The favorite spot for an early tangible sign of physical change is just above the vocal process, hidden to a great extent because it is low down on the laryngeal surface of the arytenoids. Often a patient must be examined several times before this can be discovered. Many of these cases with distinct laryngeal tuberculosis have no complaint of laryngeal symptoms and have unchanged voice. The treatment is said to be to a great extent "masterly inactivity." Thomson is quite opposed to all violent surgery of the larynx. Rest is essential, not only general rest but absolute rest of the larynx, which means entire cessation from phonation. This can be much more easily attained in a proper sanitarium where there are ample facilities at hand for attending to the wants and needs of the patient. It is much more difficult in the home. If dysphagia is keeping the patient from rest or interfering with his nourishment, it is best to amputate the epiglottis with punch forceps, if the use of a galvanocautery has failed to ameliorate the condition. No chemical caustics are found to be nearly as effectual as the galvanocautery, which is considered the only active treatment, not only for ease but for cure.

Schaeffer<sup>68</sup> uses the "silent bed cure" for patients with pulmonary lesions who have not made satisfactory progress in the usual rest treatment. He strictly advocates the need of paying more attention to restricting the amount of talking in which patients are allowed to indulge. The only objection to the use of silence is its effect on the mental condition. On the other hand, the advantage of silence is not due solely to its localized effect on the lung (and on the larynx also), but also to the lessening of general bodily fatigue and the absence of mental excitement. Thomson believes that all talking should be forbidden for a period usually of at least six months, the patient being compelled to make known his wants by signs or by writing.

Tweddell<sup>69</sup> uses, for the treatment of laryngeal and of pulmonary tuberculosis, sulphur dioxide, and considers it a most efficient remedy. Small tanks of liquid sulphur dioxide containing about 8 pounds of liquid will last about eight months. To this tank a rubber tube is attached and dipped in a glass test-tube half full of water through which gas is allowed to pass, thus regulating the amount used. A small room should be selected without metal finishings which the gas will corrode. The windows and doors are closed, and the tank is turned on so that the gas in the form of bubbles cannot be counted. As soon as the patient notices the odor of gas in the room and tastes it on his tongue, the amount is lessened until from 60 to 100 bubbles a minute are released. The patient standing not less than six feet away from the tank takes deep

<sup>68</sup> American Review of Tuberculosis, September, 1920.

<sup>69</sup> New York Medical Record, 1918, xclv, 1061.

inhalations 2 or 3 times a minute, holding his breath at the end of each inhalation for not more than four or five seconds. These inhalations should be kept up for fifteen to twenty minutes at a time, breathing through the mouth only, except in nasal tuberculosis. If much sneezing is caused, the nostril may be plugged with absorbent cotton, but coughing will do no harm. If it is excessive, the amount of gas may be decreased, or the doors and windows opened for a few minutes. Inhalations should take place 3 or 4 times a day for incipient cases, and 5 or 6 times a day for severer ones. If the tanks cannot be obtained, a teaspoonful of sulphur on any metal dish may be ignited after a few drops of alcohol have been placed on it, and the gas regulated by putting it out and relighting it, which cannot be done as accurately as when the tank is used. Twedell reports very excellent results from this comparatively simple treatment.

**Laryngectomy.** Simmons<sup>70</sup> says that the indications for total laryngectomy are:

(a) When the whole interior of the larynx is involved, nothing else offering a good prospect of recovery.

(b) When the disease, chiefly unilateral, has penetrated the cartilage and involved the muscle, it seems wiser to remove the entire structure.

(c) When there is infection of the glands in the carotid triangle, a partial removal will suffice if the disease is confined to one side of the larynx. Often a decision can only be reached after the division of the thyroid. When removal of both cords is indicated, this may be due to a limited disease of the less involved cord affecting one commissure chiefly, and under such circumstances local removal may still be successful.

The first danger in total laryngectomy is contamination of the wound. The second danger of this operation is contamination from septic secretion from the growth, some amount of which must escape when the trachea is divided. This latter danger is by far the most important. Saliva itself gives very little trouble unless mingled with food, and it is quite possible to protect against this. Infection from laryngeal secretion may be minimized by postponing the opening of the trachea to a later period in the operation and by dispensing with the preliminary tracheotomy, and also by protecting the opened intermuscular spaces with gauze packing prior to division of the trachea, by closing the cricoid ring quickly by a gauze packing and by keeping the divided trachea protected with gauze during the latter stages of the operation. A fresh scalpel should be used after dividing the trachea. The escape of mucus and saliva from the pharynx cannot be altogether prevented, but little harm is done provided the gauze protection has been properly employed. Great gentleness is necessary in the handling of the various structures and for the preservation of artery and nerve supplies whenever possible. The risk arising from the entry of blood into the trachea is avoided by not opening the latter until all the external steps of the operation have been completed and all vessels secured. The trachea is immediately

<sup>70</sup> Journal of Laryngology, Rhinology and Otology, September, 1920.

sutured in the lower angle of the wound and its lumen closed with a large tube. A vertical incision is made from the upper border of the hyoid to a point three-quarters of an inch from the upper border of the sternum. A transverse incision extends well beyond the ala of the hyoid so as to give free access to the upper cornua of the thyroid cartilage. The skin and deep fascia are reflected sufficiently to expose the muscles above the cricoid. The incision is deepened in the median line down to the cartilage, the thyroid isthmus divided and its superabundant median portion removed. The sternohyoid and thyrohyoid are divided close to the thyroid, and the lobes of the thyroid are separated from the trachea and the inferior thyroid arteries secured. The attachments of the constrictors are separated from the thyroid and cricoid cartilages, and the upper and inner surfaces of the thyroid cartilage are exposed, securing at the same time the superior thyroid artery. If this dissection has been freely carried out, the esophagus should be visible and the larynx completely movable. Cocaine is now injected in the trachea immediately below the cricoid which is packed on either side of the trachea and up by the sides of the larynx. The trachea is divided between the first and second rings, and the proximal aperture plugged with gauze. The distal portion is separated from the esophagus, brought forward and sutured into the sides of the lower angle of the wound. The anesthetization now takes place through this tracheal opening. The separation of the larynx from the pharynx proceeds from below and should be carried out equally on both sides, the cavity of the pharynx being first opened behind the arytenoids and the division carried out on both sides close to the attachment of the thyroid cartilage. Coming to the upper border of the thyroid cartilage, it is well to divide this by as small an opening as possible into the pharynx. This opening is closed by three rows of continued sutures of chromic catgut. The first should turn in the mucous coat, the second and third taking up the muscles of the pharynx. Small strips of gauze are placed behind and in front of the trachea, and gauze is laid along the pharynx. The transverse wound is completely closed and the skin of the rest of the vertical wound also. A small-sized rubber drain is inserted below the hyoid down to the pharynx, and a moist dressing employed. The patient is allowed to swallow water as soon as he can do so. The gauze packing is removed in forty-eight hours and replaced by smaller pieces, and the feeding tube can be dispensed with after the fourth day.

Canuyt,<sup>71</sup> in addition to the after-care of these cases mentioned above, gives the following points which aid in quick recovery: Usually the incision wound unites without much trouble. The surgeon should be on the lookout, however, for small deep foci of pus in the depths of the wound. In dressing the wound, layers of gauze should be applied to the neck about the cannula and covered with a layer of waterproof material to protect the wound from the excretion from the tube. Additional gauze is placed about the tube over the waterproof surface dressing to collect excretions and should be changed frequently. The cannula should

<sup>71</sup> Review hebdomadaire de Laryngologie, etc., 1918, xxxix, 293.



be cleansed frequently. The room temperature should not be high, but the bed should be comfortably warm. No attempts to speak are allowed, and coughing or clearing the throat should be done as little as possible. He reports 16 laryngectomies done by Prof. Moure in Bordeaux without a single death, and thinks that this remarkable result has been attained by the operative technic, which rests upon three fundamentals: preliminary tracheotomy, local anesthesia, and total laryngectomy from below upward, and upon posterior operative care which constitutes 50 per cent. in obtaining results. It will thus be seen that the writer differs in two out of the four points of Simmons just quoted. He depends upon general anesthesia and tracheotomy at the time of operation.

**Endoscopy.** Lynah<sup>72</sup> has successfully injected bismuth mixtures into the lung for the purpose of mapping out abscesses and the ramification of the tracheobronchial tree for *x*-ray studies, and a number of interesting things have been noticed by him during the procedure. The technic consists in aspirating, through the bronchoscope, any pus that may be present and tracing it to its source, where, with each cough, a new supply will be expelled. The abscess cavity so located is now injected with a mixture of bismuth subcarbonate in pure olive oil in proportion of one to two, rendered sterile by boiling. The anterior branch is injected around the corner by a curved, spiral cannula, and the mixture allowed to flow in slowly so as not to infiltrate the surrounding lung tissue. Eight c.c. are used and it is found that the bismuth adheres well to the cavity walls and gives a definite picture. The bismuth in the abscess cavity proper will show a characteristic metallic luster, while that in the surrounding tissue appears in the plates as a dark spot only. By this procedure it has been ascertained that abscess cavities are usually not as large as the *x*-ray plate would show them to be, since the pus-soaked adjacent lung tissue gives much the same appearance as the cavity itself in a case not injected with bismuth. Within a few minutes after the withdrawal of the bronchoscope, the bismuth mixture can be seen flowing *upward*, even without the aid of an expulsive cough. It apparently never flows *downward*, which fact leads Lynah to suppose that there is, besides cough and the cilia of the mucosa, some other mechanism to rid the lung of secretions. A portion of the bismuth may remain in the abscess cavity for varying periods up to two months, but disappears much more quickly from the uninvolved bronchi.

Far from doing harm, these injections, in the small number of cases experimented upon, gave marked relief from annoying symptoms. In one case the measured daily output of pus was decreased from 250 c.c. to 30 c.c. The foul odor and bad taste disappears, or is materially lessened, and the general health improves markedly.

This method should prove of value in the study of cough, the expulsion of substances from the lung and lung drainage. It should be most useful to the thoracic surgeon in enabling him to definitely map out a cavity before operation.

<sup>72</sup> Transactions of the American Laryngological Association, 1920.

Guisez<sup>73</sup> has examined endoscopically 420 cases of primary spasm of the esophagus and finds that most of them, while being grave and permanent, present a local pathological condition and will yield to local treatment. The usual exciting cause is defective mastication, consisting in swallowing undivided masses of food which become arrested at the narrower points of the esophagus. Liquids being swallowed in efforts to wash them down result in excessive demands being made on the esophageal wall which responds after many repetitions by permanent contracture. While many of these patients are nervous or hysterical, improper mastication and deglutition are the causative factors, and cure can never be obtained until such vicious habits are corrected.

Hubbard<sup>74</sup> says that it is important to keep in mind that in the modern conception of the physiology of digestion, muscular action is given the role of primary importance. The chemical part of digestion is rarely deficient, and hence the treatment of this disorder of function is directed toward correction of disturbances of motility, or, in other words, restoring peristalsis to the normal. This mechanical part of the function is primal, and there is, consequently, an immense concentration of nerve energy in the upper portion of the esophagus and pharynx. Rhythmic peristalsis is a physiologic function comparable in importance to respiration and heart action.

The natural termination of reserve peristalsis is in the hypopharynx, and while it is the usual habit to attribute certain throat disorders to objective findings, or to etiological factors operating from above downward, it is occasionally necessary to reverse this method and to take into consideration disturbances from below upward.

While complete reversal of peristalsis culminates in emesis, the important clinical manifestations are partial or abortive reversals, causing globus, heart-burn, aërophagia, belching, regurgitation and nausea. These symptoms suggest conflicting reflex impulses, and incoördinated or reversed muscular waves culminating in the hypopharynx. Such symptoms are often attributed to the throat, and are too often treated as such.

Hubbard uses the term *Esophagismus* in preference to *globus* which is usually associated with the word "hystericus," and while the psychic factor is undoubtedly present in many, or most, cases, it is not necessary to assume that hysteria is the cause. Contesting peristaltic waves produce muscle fatigue and irritation of the mucosa characteristic of globus, and in the milder cases with simply the sensation of a lump in the throat and fatigue or muscle pain, with a burning sensation of the mucosa, the diagnosis is often difficult, and they are frequently inadequately treated as throat cases.

A *foreign body sensation* is very common in this type of throat trouble, and indeed throat hysteria can be induced by a real foreign body, such as a pin-prick or a bone scratch, the suggestion enduring indefinitely. Overstretching, eating very cold foods, accidental choking, overtense emotions, overtreatment of the throat, or bad surgical scars may cause

<sup>73</sup> Bulletin de Académie de Médecine, February 17, 1920.

<sup>74</sup> Transactions of the American Laryngological Association, 1920.

this psychic fixation. Negative findings by the laryngologist fail to make any impression, but esophagoscopy *ad nauseam* will make an impression on a mind favorable to recovery.

Cardiospasm may persist to such a degree that the life of the patient is threatened by starvation, and this may be a phenomenon of partial or abortive reversal. Chronicity follows the distortion due to sacculatation above the stricture, but, at postmortem, little or no hypertrophy of the muscular fibers is found. The psychic factor is always in evidence in these cases.

Hubbard concludes that:

1. The pharyngeal plexus is concerned with a primitive function of such vital importance that even slight disturbance may provoke psychic interference, with resulting confusion of automatic reflexes.

2. Chronic spasmogenic phenomena, esophagismus and cardiospasm, may be, primarily, manifestations of irregular or reversed peristalsis.

3. The hysterical throat is a manifestation of paresthesia and incoordinated muscle actions, with psychic fixation in neuropathic individuals.

4. It is probable that disease conditions and local irritations of the gastro-intestinal tract may initiate the reverse peristalsis involving the esophagus. Abnormal reflexes and sensations are naturally referred to the beginning of the vegetative tract—the region of the pharyngeal plexus.

5. Through intimate anatomical association, the throat and larynx participate in the clinical syndrome. The gastric factor in asthma may be thus explained.

6. The more we emphasize peristalsis as a factor in digestion, the more important is it to properly interpret abnormal peristalsis as a factor in disease.

### HAY-FEVER AND ASTHMA.

The discussion of hay-fever and asthma may for convenience be divided under three headings:

1. Determination of the specific sensitizing agent.

2. Methods of prophylaxis and treatment.

3. Results of treatment.

During the last two years the cutaneous tests for determining the sensitizing agent in hay-fever, asthma, and allied disturbances showing an anaphylactic type of reaction, have come into quite common use, and the method has been exploited in the lay press under sensational headings, as, for example, "Asthma Clinic Cures by Injecting Horse Hair and Burnt Goose Feathers." Nevertheless, with the increasing availability of testing substances of different kinds, this form of diagnosis is bound to increase in popularity, since the technic is easily carried out and numerous cures can be made if only by avoiding contact with the known irritating cause of the paroxysms.

Walker<sup>75</sup> writes on the frequent causes and treatment of what he calls

<sup>75</sup> Journal of the American Medical Association, September 18, 1920.



"*Perennial Hay-fever*," meaning thereby symptoms similar to those produced by seasonal pollinosis but occurring at intervals during the year when the action of pollens could be excluded, and where intranasal causes could also be excluded by examination, or by operation upon abnormalities failing to relieve the condition.

It has been well recognized for years that certain persons were susceptible to hay-fever-like reactions from exposure to animals, and, likewise, that the ingestion of certain foods, or the presence of certain bacteria within the nose, exclusive of definite infective processes, would cause the same results. In such cases it is usually the protein in these substances that causes symptoms, though in the case of bacteria it may be either the protein or the infectious element. In testing with animal emanation, or epidermal protein, the protein and the peptone should be used separately; with the cereal grains, the globulin fraction of the protein is most important, with other foods, with pollens and with bacteria the whole protein suffices. The cutaneous skin-test consists of inoculating a series of small cuts or abrasions with the different substances to be tested. A positive reaction consists of a definite wheal, and the protein giving such a reaction should always be considered the cause of symptoms until proved otherwise.

Having thus discovered the causative agent, desensitization treatment is instituted, first determining by skin reactions made with different dilutions of the offending protein the strongest solution that fails to give the slightest reaction and starting with this. The initial dose is 0.1 c.c. which is increased by 0.1 c.c. at each weekly dose until a maximum of 0.8 c.c. is used, when the next stronger dilution is used, if necessary. Many persons are sensitized to horse hair and horse dandruff proteins, and care must be exercised in order to avoid overdosing. The same treatment can be successfully applied to those sensitized to cat emanations, feathers, dogs, rabbits and guinea-pigs. In the latter case, it is usually easier to avoid contact with the offending protein than it is to be desensitized, a change from feather pillows to hair or floss, or doing away with pets, accomplishing a cure. The same treatment applies to food products, so that in these classes the diagnosis is the important point, although foodstuffs inhaled cause more symptoms than those that are eaten.

The author has found that it is not uncommon for seasonal pollen hay-fever patients to have paroxysms of hay-fever and frequent head colds throughout the year, occasioned by exposure to dust, drafts, irritating odors, etc. Pollens may therefore be a cause of hay-fever outside the pollen season, and such patients may be relieved of perennial hay-fever by successful pollen treatment. Both Walker and Goodale have observed similar symptoms caused by orris root face powder, or by rice powder in a case sensitive to rice, and I have also seen such cases.

The presence of pronounced eye symptoms indicates probable sensitization to some protein, and absence of eye symptoms indicates the improbability of sensitization to some protein as a cause. As in the bacterial cases, eye symptoms are lacking, and, as they do not respond to any of the sensitization tests and are often relieved by autogenous

vaccines, they should properly be called vasomotor rhinitis rather than hay-fever.

Walker's conclusions are here reproduced:

"Perennial hay-fever is frequently caused by animal emanations, and cutaneous tests should be made with the common animal epidermal proteins.

Those patients whose hay-fever is caused by exposure to horses may be successfully treated by repeated inoculation in gradually increasing amounts of the particular epidermal protein to which they are most sensitive.

Those patients who are sensitive to cat hair protein may be treated similarly with equal success. Dispensing with the cat, however, is easier of accomplishment and is usually beneficial.

With those who are sensitive to the epidermal proteins of other animals (pets), it is preferable to avoid that particular animal. Sensitization to feather protein from feather pillows is frequent, and the substitution of floss pillows is desirable.

Perennial hay-fever is frequently caused by the ingestion of foods and by the inhalation of the cereal grain flours. Cutaneous tests often reveal such a cause, and omission of the protein is the desirable mode of treatment.

Patients who have seasonal pollen hay-fever frequently have paroxysmal symptoms throughout the year. Satisfactory preseasonal treatment with the particular pollen that causes the seasonal hay-fever frequently relieves the perennial symptoms.

Recurring head colds are frequently coincident with the foregoing sensitizations, and relief from these head colds usually follows proper treatment, as already outlined. This type of head cold is probably not due to an infection but rather a result of sensitization which renders the nasal mucous membrane easily irritable.

Non-sensitive patients with perennial hay-fever or vasomotor rhinitis, provided there are no demonstrable abnormalities, growths, and the like in the nasal cavities or sinuses, are sometimes benefited or relieved by autogenous vaccines made from the nasal secretion. The same statement also holds true for those patients who are subject to frequent head colds.

Olfactory vasomotor rhinitis, or pseudo-hay-fever, caused by mechanical, thermal, chemical and odorific irritants, is not uncommon and should be recognized.

The ingestion of foods may cause symptoms referable to the eyes alone. Therefore, although protein sensitization should not be considered as a "cure all" or a cause of all obscure conditions, the cutaneous test for protein sensitization deserves a place among diagnostic tests; and when properly performed and interpreted, it is a very useful test.

Rackemann<sup>76</sup> has made an experimental study of the treatment of hay-fever by means of repeated injections of the specific pollen which causes it. He reports upon 91 cases of ragweed hay-fever. The extract

<sup>76</sup> Boston Medical and Surgical Journal, March 18, 1920.

of ragweed pollen was made according to the method of Wodehouse,<sup>77</sup> a stock extract being used which retained its potency even when kept at room temperature for over two months. Intradermal tests were used, controlled by injection of salt solution, extracts of red top, timothy, and horse-hair extract in order to demonstrate that the reaction was specific. The method for prophylactic treatment is to begin six weeks in advance of the date of the expected attack, which is generally well known in different hay-fever localities. The first dose was 0.05 c.c. of the 1 to 1000 dilution, which is equivalent to 0.02 mgs. N per c.c., and if the preliminary skin test gave a large reaction, no further treatment was given that day. Succeeding doses at five- or seven-day intervals were in each case determined by the amount of local reaction following the previous injection. If this was slight, so that the local swelling did not exceed  $\frac{1}{2}$  cm. in circumference, the succeeding dose was doubled or trebled, and the treatment was continued for at least a week after the usual time for the attack to begin.

Rackemann's results are as follows:

Out of 91 patients, 8 (or 8.9 per cent.) were entirely relieved and had no symptoms of hay-fever; 37 (40.6 per cent.) were greatly relieved; 20 (22.0 per cent.) showed considerable improvement; so that 65 (71.5 per cent.) were definitely improved. Fourteen patients (15.4 per cent.) showed some relief, while 12 (13.1 per cent.) had absolutely no relief or were even worse.

These figures compare favorably with the results obtained by other writers. For example:

Clowes<sup>78</sup> reports that 25 to 30 per cent. show a marked alleviation of symptoms and a further 30 to 40 per cent. show a marked improvement, while the rest are unaffected. He uses a watery extract of pollen which has first been dehydrated with acetone and ether.

Cooke and Vander Veer,<sup>79</sup> using an extract much like the author's, report that of 251 patients treated for late (ragweed) hay-fever in 1915, in 16.3 per cent. of their cases, hay-fever was absent or insignificant; in 43.8 per cent., it was greatly diminished; in 15.5 per cent., it was slightly diminished, while it was as bad as usual in only  $\frac{1}{4}$  per cent.

Koessler,<sup>80</sup> using a pollen extract purified by alcohol precipitation and subsequent resolution in saline, treated 37 cases of fall hay-fever with these results:

Markedly free, 29 cases (78.4 per cent.).

Not improved, 8 cases (21.6 per cent.).

Solomon, Strauss, and Frank,<sup>81</sup> in a review of 241 cases of all kinds of hay-fever treated with pollen extracts and reported prior to 1916, say that 45 (18.6 per cent.) were entirely relieved, 157 (65.1 per cent.) were somewhat relieved, and 38 (15.6 per cent.) not changed.

Systemic reactions were observed by Rackemann in 14 instances in 7 patients during the administration of 728 injections, 1.9 per cent.

<sup>77</sup> PROGRESSIVE MEDICINE, March, 1917.

<sup>78</sup> John Hopkins Hospital Bulletin, 1916, xxix, 87.

<sup>79</sup> Journal of Immunology, 1916, i, 201.

<sup>80</sup> Forchheimer Therapeutics of Internal Diseases, 1914, v, 671.

<sup>81</sup> Journal of the American Medical Association, 1916, lvi, 712.



Most of the reactions seemed to follow a rapid increase in the dose after a relatively short interval, though in several instances reaction followed a comparatively slight increase in the dose.

Walter<sup>82</sup> reports one case of profound anaphylactic shock when a dose of ragweed pollen extract, of the same size as the last previous dose, was administered five days after the usual date of the attack, no symptoms having been experienced up to this time. He believes that this was due to the local pollen absorption through the nasal mucosa in massive doses, and since that time he does not give preseasonal doses, but, on the contrary, he has adopted an alkaline dietary and regimen, and the frequent use of fractional doses of the pollen protein hypodermically in all cases at season. The results have been universally encouraging.

Walter's experience with pollen extracts was that they only delay the incidence of the attack for about five days and modify the early severity, but probably increase the sensitization after the first few days. These inoculated patients suffered more during the height of the attack when the massive pollen contact came, than those who did not have preliminary treatment. In the early mild pollinoses, the "rose-colds" inoculation is very much more satisfactory. The reason for his failures in preseasonal inoculation with ragweed pollen he believes to be that this particular pollen is a burr capable of breaking the nasal mucosa and that mass dosage is likely. This pollen in man, when split up by the sensitized subject, is more toxic than other pollens. In addition, secondary infection, caused by injury to the mucosa, contributes to make the disease worse. He fears, therefore, that when the mass of pollen comes, the split products go to full tide; an anaphylatoxic poisoning results, and that preliminary inoculation cannot be carried far enough with ragweed protein to evolve anti-anaphylactic bodies, on account of the size of the dose of ragweed protein at season.

It is contended by many writers that *distorted function of the Endocrine Glands* must not be overlooked in the study of hay-fever and vasomotor disturbances. Selfridge<sup>83</sup> has gone into the whole question extensively and believes that disharmony of the endocrine glands is probably the fundamental basis of sensitization or anaphylaxis, a conclusion reached by Sajous in a paper read before the Philadelphia Laryngological Society in 1915. The opinion is forcibly expressed that it is impossible for any living person to make a correct differential diagnosis of vasomotor instability of the upper air passages without the use of proteins of pollens, foods, animal hair, feathers and bacteria. In 26 cases of vasomotor rhinitis, 14 which were studied with this end in view were found with signs of slight endocrine gland insufficiencies. Of 21 cases of hay-fever in which treatment with pollen extracts was begun *after* the beginning of the hay-fever season, 14 had no attacks after the first injection, while the other 7 were measurably relieved. Of 8 in whom treatment was started several weeks before the season, 7 were entirely free of attacks. The success in these cases would seem to be due to the fact that 125 different pollens were used for testing purposes, and

<sup>82</sup> Journal of the American Medical Association, September 4, 1920.

<sup>83</sup> California State Journal of Medicine, April and May, 1919.

the extracts used according to indications, instead of assuming that all cases are of ragweed origin, and simply injecting stock commercial extracts of that pollen, a practice strongly deprecated by Walter, mentioned above. The question is, however, in what other way is the average busy laryngologist who is not his own botanist, going to obtain his extracts? I suppose the answer is that, where possible, these cases should be referred to the better equipped colleague, but this, however desirable, is not always practicable. Selfridge differs from the conclusion of Goodale and other Eastern investigators "that reaction from timothy will give reaction to all other grasses," though he admits that all grasses of a single tribe may react more or less to other grasses of that particular tribe.

In only 4 of these hay-fever cases was a definite gland deficiency proved, but in all cases low blood-pressure was found, subnormal temperature and pulse, and a general complaint of more or less asthma, which seem suggestive. The conclusion reached is that the use of pollen solution chosen from the flora of the patient's locality after careful testing, is of *very great* value in warding off seasonal hay-fever and that ductless gland therapy may later prove of value in determining a permanent cure.

**Asthma.** More attention is being paid latterly to the cause of the sensitization in bronchial asthma as well as hay-fever and allied disturbances, and many authors are agreed upon the theory of endocrine gland disharmony. Pollock<sup>84</sup> concludes that this is the underlying cause that must preëxist, though exciting factors must also be present. Good results have followed his treatment on this basis.

Gottlieb<sup>85</sup> gives a free and concise outline of treatment, insisting at the start that every case must be studied with a view to detecting endocrine disturbance, and more particularly focal infection or infected areas that may be sources of reflex irritation. Skin tests should be made with autogenous bacteria as well as with stock bacterial proteins, epidermal and food proteins and pollen.

All foci of infection should be eradicated when found. Change of climate has no therapeutic value except in cases of asthma due to pollen, though a change of scene and air is of use after a proper diagnosis has been made and suitable treatment instituted. Drugs help carry the patient over the attack, but have no curative effect. Specific therapy is the rational method of treatment, and, of course, avoidance, when possible, of any protein to which the patient is sensitive. When asthma is due to only one food, avoidance of that particular food should be demanded, but the complicating bronchitis, when present, must be treated by suitable bacterial vaccine therapy. When sensitiveness to more than one food is present, as is usually the case, and when, in addition, there is epidermal, pollen or bacterial anaphylaxis, the problem is more complicated. Most foods may be easily eliminated from the diet except milk, eggs and meat. By boiling milk, the lactalbumin becomes coagulated and rises to the surface as a scum which is easily removed.

<sup>84</sup> Laryngoscope, 1918, xxviii, 543.

<sup>85</sup> Journal of the American Medical Association, April 3, 1920.

Milk so treated can be taken with impunity. The patient can be desensitized to eggs and meat, either by including very small portions in the diet and raising the amounts, or by gradual increase subcutaneously. The most satisfactory class to treat is that sensitized to epidermal proteins, though the immunity obtained is not always permanent.

The asthma that is due to pollen anaphylaxis usually develops during the latter part of the season. This is explained by the fact that at first the nose alone receives the irritating pollen. When this becomes swollen and stopped up, the patient breaths through the mouth, thus receiving the irritating pollen directly on the tracheal and bronchial mucosa without the filtering action of the nostrils. As a result, the pollen causes the same swelling to occur in the bronchial tubes as is present in the nose, thus producing an attack of true bronchial asthma. Nothing in the way of relief can be expected from specific treatment given after the attack is well under way. It is without reason to add to the pabulum of pollen protein by injecting extracts into a person who is saturated with these and constantly absorbing more through his respiratory mucous membranes.

Fagniez<sup>86</sup> finds that the treatment of asthma by intravenous or subcutaneous injections of peptone, or with peptone in enemas, is effectual but transitory. These methods are inferior to the American method of gradual desensitization by vaccination, but the former is so easy and simple that they encourage further researches along this line.

Hutchinson and Budd<sup>87</sup> have had marked success in treating bronchial asthma with autogenous vaccines. The cases selected were those where obvious foci of infection had been removed, and the results compared favorably with those of Gottlieb in this class of cases. Like the latter, they found that often when the first series of injections was ineffectual, a second vaccine preparation would give results, explained by the probability that the specific infecting organism had been overlooked in the first preparation. This possibility must always be taken into consideration in all kinds of vaccine therapy. Gottlieb finds also that when definite improvement, but not cure, has resulted from the initial series of injections, much more rapid improvement follows a second or a third series either with the same or a freshly prepared suspension. Hutchinson and Budd obtained very definite relief, or complete freedom from asthmatic attacks in 74 per cent. of cases treated, the longest period of complete immunity being, however, but three years.

### LOCAL ANESTHESIA.

The report of the Special Committee of the Section of Otolaryngology of the American Medical Association, Mayer, Skillern and Sonnenschein<sup>88</sup> on the use of local anesthesia in Nose and Throat Surgery is of the greatest interest to all of us and should be studied in detail and *in extenso*.

As the result of an extensive résumé of the literature and of a question-

<sup>86</sup> Presse Médicale, January 24, 1920.

<sup>87</sup> Virginia Medical Monthly, February, 1920.

<sup>88</sup> Journal of the American Medical Association, July 31, 1920.



naire, it was found that certain disadvantages were claimed by the opponents of local anesthesia, these disadvantages being difficulty of controlling bleeding at the time of operation, tendency to postoperative hemorrhage, difficulty of sterilization, edema and sloughing, and toxicity.

Local anesthesia is favored by almost all American rhinolaryngologists and the consensus of opinion is that there is no greater tendency to hemorrhage, either primary or secondary, than when general anesthesia is employed. There is more apt, of course, to be bleeding following the removal of a tonsil that is fibrous than one which is not, but there appears to be no difference in this respect no matter which form of anesthesia is employed. Indeed most of us who do our nasal work under local anesthesia with the addition of adrenalin feel that the disadvantage in this respect lies with the general anesthetic, that adrenalin, applied *after* ether narcosis is obtained, is ineffectual in controlling very annoying hemorrhage, and, if applied before ether is started, the inconvenience to the operator and distress of the patient is just as great as when the operation is completed with the addition of a local anesthetic and without ether.

Adrenalin sometimes loses its ischemic properties by boiling and is therefore difficult of sterilization, but this is only of importance when it is to be employed for injection, since in topical applications to mucous membranes, complete sterilization is not absolutely necessary.

Quinine and urea hydrochloride is found to be the only local anesthetic that produces edema and sloughing, and almost all the writers who warmly advocated its use a number of years ago, have now discontinued this practice, although, as the Committee complains, they have not come out in print and retracted their former views. The use of quinine and urea hydrochloride as a local anesthetic in nose and throat work has practically gone into "innocuous desuetude."

The Committee found only one case in the literature where idiosyncrasy was claimed as the cause of toxicity. The anesthetic was cocaine, and the patient had suffered for years from tachycardia, excessive perspiration, and dysentery. A small dose of the drug, ordinarily non-toxic, was thus sufficient to upset the feeble balance of many years.

Toxic effects range from mild symptoms to grave and threatening ones, or to sudden death. Twenty unpublished deaths were collected by means of a questionnaire and are analyzed in detail. A review of these fatalities shows that 14 occurred as a result of the administration of cocaine, and 6 from procaine. Of the former, 5 were due to avoidable mistakes. The remainder died, as a rule, within three minutes after the administration of the drug.

Animal experiments apparently showed that the previous injection of morphine does not increase, but rather minimizes, the danger of local anesthesia since there is, in many instances, a state of apprehension to operation which the hypnotic is likely to allay. Its use is not contraindicated and it should be given a further trial.

American rhinologists greatly favor local anesthesia for nose and throat surgery, finding that there is less hemorrhage, far greater safety especially when near the cribriform plate and that the dangers of toxicity will

compare favorably with those of general anesthesia, since thirty-seven deaths have been reported by one observer from the use of only nitrous oxide and oxygen.

As a result of the study of the literature, clinical experiences and animal experimentation, the Committee concludes that:

1. There is a remarkable similarity in the clinical effects and animal experimentation.

2. None of the synthetic products equals cocaine in its local effect when applied to the mucous membrane.

3. These synthetic products may be freely injected, if slowly done in proper doses, in unlimited quantities.

4. Fatalities either occur immediately or not at all.

5. The drug is eliminated in the liver.

6. The greatest danger lies in too rapid injection or entering a vein.

7. A peculiar susceptibility which we term idiosyncrasy does exist, as the drug enters into the circulation so rapidly that death is almost immediate.

8. A further study of the toxicity of these local anesthetics will result in definitely establishing the causes of death.

9. Local anesthesia is undoubtedly the choice of methods of all American rhinologists in nose operations.

10. It is also the choice of a very large proportion of American laryngologists in throat operations.

11. There is a small number who believe that tonsil operations particularly are best performed under general anesthesia.

12. The dangers of hemorrhage during tonsil operations under local anesthesia are no greater than under general.

13. There is no greater danger from postoperative hemorrhage under local than under general anesthesia.

14. The previous administration of morphine requires further investigation.

The committee suggests that all operations be performed with the patient recumbent, beginning with the first application of the local anesthetic, except in sinus operations, in which the head and shoulders may be elevated to an angle of 45 degrees and the table raised so that proper direction may be maintained.

Each operation should be preceded by a hypodermic injection of morphine and atropine, and the patient kept in the hospital.

In nose operations, adrenalin should be applied first, followed by cocaine, and the injection of the synthetic drug introduced slowly.

In throat operations, a 5 or 10 per cent. solution of cocaine should be applied, followed by the slow injection of the synthetic product.

When there may be a suspicion of possible danger, one-fourth of the amount of anesthetic to be used at the time of operation should be applied and the patient watched for possible toxic effects.

Among the cases included in the latter are those with evident cardiac disease, exophthalmic goiter, or other disturbances of internal secretion.

Local anesthesia is the ideal method of operating for affections of the nose and throat.

None of the dangers that have been mentioned are any greater than those following general anesthesia.

Discussion of this report by Matas brought out the fact that the general surgeon is heartily in favor of the preliminary use of morphine and atropine especially for throat work. The addition of adrenalin to whatever anesthetic is employed makes for safety since it limits its spreading, and therefore absorption by the tissues. Local anesthesia should not be used on patients being operated upon before large audiences. Everything should be quiet and peaceful, and there should be no distracting noises.

Allen<sup>89</sup> suggests that cocaine crystals can readily be sterilized by placing them in a dish and covering them with alcohol, benzin or gasoline, which is then allowed to evaporate. This destroys organisms, but in no way impairs the efficiency of cocaine or procaine. He firmly believes in morphine as a preparatory agent since highly neurotic and excitable individuals stand cocaine poorly, but as an antidote to cocaine it is useless.

**Deep Alcohol Injections for Trigeminal Neuralgia.** Cushing<sup>90</sup> decries the intranasal injection of Meckel's ganglion, as practiced by the rhinologist with Sluder's technic, as he believes it can be reached far more safely by the external method through the cheek. By the Sluder method he fears critical secondary hemorrhage. Of interest here is the method of injecting the sphenopalatine ganglion through the posterior palatine canal described by Reaves<sup>91</sup> as follows:

1. Brush the hard palate with a solution of cocain along the root of the molars.

2. Place the index finger on the hamular process of the internal pterygoid plate and bring it forward until a depression, the lower end of the posterior palatine canal, is palpated.

3. Place the needle at an angle of about 45 degrees with the upper teeth and along the second molar about  $\frac{1}{8}$  inch from its root. This brings the needle near the canal, which it usually enters after three or four attempts. Pass the needle upward about 2.75 to 3.5 cm. (1 to  $1\frac{1}{4}$  inches), when the point will be near Meckel's ganglion. Inject from 1 to 1.5 c.c. of 1 per cent. solution of procaine.

Cushing contends that the deep injection of alcohol for neuralgia has its limitations, not the least being that relief is but temporary and that with each successive injection a shorter interval of freedom from pain is apt to be secured. This also applies to peripheral operations and they may in addition leave unsightly scars. There are certain untoward results seen following alcohol injections. These are paralysis of the oculomotor nerves, locking of the jaw from infiltration, and subsequent fibrosis of the pterygoid muscles. Paralysis of the motor fifth is usual, and function may not be regained. Even sloughs of the "nasal bones" and ozena have been reported, and facial paralysis is not uncommon. At times the Eustachian tube has been reached with the needle and the middle ear filled with alcohol leading to otitis media and labyrinthitis.

<sup>89</sup> Journal of the American Medical Association, July 31, 1920.

<sup>90</sup> Ibid., August 14, 1920.

<sup>91</sup> Ibid., May 29, 1920.



Alcohol injections have supplanted peripheral neurectomies and are the operations of choice in neuralgia limited to the two lower divisions of the fifth nerve, but wherever repeated injections are necessary, trigeminal sensory root avulsion is indicated as being at the same time the most safe and the most satisfactory.

Reaves, quoted above, obtains anesthesia of the entire nasal chamber on one side by *nerve blocking* at two points; namely, the exit of the nasal nerve from the orbit, and Meckel's ganglion. The technic for the latter has just been described. For injecting the nasal nerve he instils a few drops of 4 per cent. cocaine into the conjunctival sac, lifts the upper lip upward and inward, and directs the patient to look outward. The needle is inserted through the plica semilunaris just below the lacrymal puncta, directing it slightly inward and upward, at an angle of 30 degrees. The needle soon strikes the os planum, and on moving the point up and down when inserted about 2 cm. it engages in a groove, the anterior end of which terminates in the anterior ethmoid foramen, where the nasal nerve leaves the orbit. One c.c. of a 1 per cent. procaine solution is injected. This procedure is said to be easy of accomplishment and, in combination with the injection of Meckel's ganglion, to give perfect nasal anesthesia. In the latter injection the needle may pierce the soft palate if inserted too far backward, while if too far forward, a blood-vessel may be pierced. The second molar tooth is the guide in searching for the posterior palatine canal. The needle should not be too sharp, thus avoiding injury to the vessels in the posterior palatine canal. In a few cases edema or discoloration of the eyelids, and paralysis of the internal rectus was noticed, but these were transitory. Reaves notes that the saline solution in which the procaine is dissolved must be neutral or only slightly acid in order to get the full anesthetic value of the drug, and advises packing the nose with cocaine and epinephrin previous to operation in order to control bleeding.

**Route of Infection in Poliomyelitis.** Flexner and Amoss<sup>92</sup> find that an effective nasal mucous membrane prevents the passage of the virus of poliomyelitis to the brain and cord, but that slight injury to such independent structures as the meningeal-choroid complex favors the passage of the virus from the nose to the central nervous system. They conclude that the normal nasal mucosa is an invaluable defense against infection of this character; and the number of healthy and chronic carriers is probably determined and kept down through the protective activities of the membrane. Antiseptic chemicals placed on this mucosa exhibit no great protection and are of doubtful value, and may even be detrimental by affecting unfavorably its normal destructive properties.

## THE EAR.

**Carcinoma of the External Ear.** The successful treatment of early superficial cancer of the external ear may seem a simple matter, but Sutton<sup>93</sup> assures us that it is often difficult of accomplishment. He

<sup>92</sup> Journal of Experimental Medicine, February 1, 1920.

<sup>93</sup> Journal of the American Medical Association, January 10, 1920.

bases his study upon 17 cases seen during the past ten years and adds some interesting data to a usually neglected subject.



FIG. 47.—Basal-cell carcinoma of ear involving cartilage of eighteen months' duration; very painful. (Sutton.)



FIG. 48.—Multiple basal-cell carcinoma of the ear; of three years' duration; no lymph node involvement; radical operation, followed by cure. (Sutton.)

The difficulty in obtaining a cure in these cases is due to the close apposition of skin to cartilage and the poor blood supply of the latter,

so that even if not primarily involved in the malignant process, it is subject to chronic inflammatory changes which prevent prompt healing after the removal of the neoplasm.

Sutton's cases ranged in age from twenty-eight to eighty-one years, and the growths examined were of the basal-cell type. In thirteen instances, they had developed from seborrheic keratoses, and in nearly every case, there was a history of a primary injury, such as a cut or bruise. Eleven of the patients had also suffered from frost bite. All the lesions developed above the level of the floor of the external meatus, and in no instance was the lobe involved primarily. The upper portion of the helix was the favorite site of invasion, in some instances after having been injured by the bow of a pair of spectacles or a razor cut.



FIG. 49.—Carcinoma of the ear, showing ulcer that remained after radium therapy. Lesion healed under the action of soothing local applications in seven weeks; no recurrence had taken place one year later. (Sutton.)

The history of invasion was similar in all; a slight injury was followed by a small, superficial ulcer which healed slowly, usually because the patient deliberately scratched off the scab or rubbed it off with a rough towel. After healing, a small keratosis developed which, in the course of months or years, became malignant. The mild initial symptoms of itching and burning were later succeeded by throbbing, penetrative pain of severe character as the carcinoma developed and the deeper structures were involved.

Ears should be suitably protected from the cold as a prophylactic measure, and slight wounds of the auricle should receive prompt surgical attention. The seborrheic keratoses can usually be controlled by the daily use of a mild keratolytic, such as salicylic acid ointment (10 per



cent.). Early and radical removal is the safest course in the spindle-cell type, and the actual cautery is preferred to carbon dioxid snow as it seals the bloodvessels and often does satisfactory work. Unfortunately, the tissues in this region heal slowly after cauterization, and fulguration is considered painful and unreliable. If the cartilage has not been involved, the *x*-ray is efficacious and radium even more so. I should think it would have to be used with great caution as our experience with its use in the larynx, quoted above, have been that cartilage is but slightly resistant to its rays. Sutton says that a severe reaction is seldom necessary and should always be avoided. The very thin skin provides only a slight protection to underlying structures and inflammatory changes subside very slowly. Prompt excision is the best and safest plan in all cases and, in early cases, cosmetic results are usually satisfactory.

**Deafness.** Deafness produced by concussion may be caused by a single detonation or by a succession of loud sounds. Richardson<sup>94</sup> discusses the use of ear protectors in those likely to be exposed to injury by either of the above-mentioned types of concussion in warfare, but their application to certain pursuits of peacetime is equally important. The riveter, the boilermaker, the blacksmith, the steel foundry man, as well as the marksman in rifle and artillery practice is frequently, if not habitually, subject to such injuries and, since the usual treatment is ineffective, it has long seemed to me that more attention should be paid to prevention.

In this respect the peacetime protector can be used more freely than the wartime one, for in the latter, the protector chosen must be soft in order to avoid further injury to the ear in case it is struck with some flying missile. This was a great disadvantage in many of the war-time protectors which were made of hard substances. They might be driven into the middle ear, themselves causing injury and acting as foreign bodies. The soft protector avoids this, but, as a rule, excludes sound waves to such an extent that oral communication is interfered with, a great drawback for the soldier.

This subject was discussed in *PROGRESSIVE MEDICINE*, March, 1918, and since that time many cases have been observed in our practices and hospitals caused by injuries received while serving in the army. Such injuries comprise rupture of the membrana tympani, injury to formerly suppurating ears causing reinfection with discharge, organic injury, either slight or complete destruction of the labyrinth (organ of Corti) or functional disorders of the central nervous system.

Richardson finds that cotton saturated with glycerine or vaseline is the cheapest, most available and easiest protector to obtain and that it affords efficient protection, but also deafens the wearer more than other devices, a conclusion concurred in by McKernon<sup>95</sup> and most of the men serving with troops at the front or in hospitals in the A. E. F. It would seem, however, that any use of protectors was not usual in the stress and excitement of battle.

<sup>94</sup> *Laryngoscope*, 1918, xxvii, 514.

<sup>95</sup> *Annals of Otolaryngology and Rhinology*, March, 1920.

This whole subject merits further study from the angle of occupational deafness, since we constantly see these unfortunates in our clinics and can only advise a change of occupation which is often a great hardship to the individual. Just as men working in poisonous fumes and dusts have been gradually educated to understand the value of the respirator, so should those in the aforesaid classes, be instructed in the danger of continuous noise and the value of prophylaxis. Industrial medicine has developed rapidly during recent years, and this teaching should be the function of the plant physician who in turn should be instructed by the otologist.

Love<sup>96</sup> divides all deafness into two simple classes—true hereditary deafness and acquired deafness due to disease, including in the latter class congenital cases arising from syphilis. By invoking the Mendelian law and making comparison with hybridization caused by crossing tall and short sweet peas, he attempts to show that sporadic congenital deafness is clinically and genetically identical with true hereditary deafness, that congenital deafness is truly hereditary, and that such heredity is Mendelian.

The two objections commonly raised to the theory are that (1) as a rule congenitally deaf parents have hearing children and (2) that hearing parents often have deaf children.

Love describes a hearing person with a family history of congenital deafness as one "carrying deafness" or as possessing a true taint which may appear in the progeny under certain given conditions. Thus, so long as hearing people carrying deafness marry pure hearing people, no deafness results. But if, by chance, and the chance is bound to come, two hearing people, carrying deafness, marry, deaf children must follow:

Six different combinations of hearing and "carrying deafness" people are given, and the results that can be expected from their intermarriage:

Class 1. A hearing man, whose parents heard and did not carry hereditary deafness, marries a similar woman. No deaf children can result. This is usually the case, since there is only one person congenitally deaf out of every four thousand of the population of England.

Class 2. A deaf man, both of whose parents are hereditarily deaf, marries a similar woman. All the children are born deaf.

Class 3. A pure hearing person (without taint) marries a deafmute. All the children may hear, as the hearing trait is dominant to the deafness trait, but they are persons carrying deafness and deafness may be expected in the next generation under certain conditions explained below.

Class 4. A hearing man carrying deafness (Class 3) marries a hearing woman carrying deafness (Class 3), both deaf and hearing children follow if the family is at all large.

Class 5. A hearing man carrying deafness marries a pure hearing woman and no deaf children will result but half of them will carry deafness and if they unite in their turn with those in Classes 2, 3, 4 or 6, deaf children will result. If these deafness carriers *always* married pure

<sup>96</sup> Journal of Laryngology, Rhinology and Otology, September, 1920.

hearing persons, no deaf children would result, but the former kind of a marriage seems rather common.

Class 6. A hearing man carrying deafness marries a pure deaf woman. Here half the children are deaf and all the children carry deafness. This is the common type of marriage among the deaf, since the deaf and their hearing relatives are necessarily thrown much together and unions producing deaf children are the result.

It is clear, from a study of the above, that measures to eradicate hereditary deafness must be applied not only to the deaf but to the hearing "deafness carriers" also.

Yearsley<sup>97</sup> speculates whether acquired deafness can lead to congenital deafness and gives a family tree that would make such a supposition seem possible, but states that it is the only example of this kind that he is aware of. In this instance, a member of a family, in which the grandmother and two great aunts had acquired deafness, four aunts had acquired deafness (there were also some hearing uncles), who was not deaf himself, married a woman with a negative family and personal history. Three hearing and two congenitally deaf children resulted. The deafness, he thinks, was probably otosclerosis. The explanation in this case would possibly lie in the fact that these parents were probably in Love's Class 4 as "deafness carriers," though unrecognized, and that the history of acquired deafness was only a coincidence.

**Trauma of the Middle Ear.** Abrand<sup>98</sup> says that in wounds of the tympanic cavity in wartime, the essential factor is a nearby, violent explosion, in which a difference of pressure is of more importance than the loudness of the noise. Usually, one ear only was found affected, and subjectively the patient complained of impaired hearing, tinnitus and pain. The impairment of hearing was obviously in direct relation to the extent of the injury; the Rinné was positive even with an extensive laceration of the drum, if the latter was healthy, but if any inflammation at all set in, the Rinné immediately became negative.

In the slightly affected cases, the drum membrane was merely reddened and lusterless; in the more severe cases appearances ranged from small brown ecchymoses to tympanic rupture, with swollen tissue about the wound. More hemorrhage was encountered when the perforation occurred near the malleus or the tympanic ring. The site of perforation might be anywhere, but was very frequently seen below the umbo. Ruptures of the drum caused by concussion usually heal spontaneously if left alone and not infected, but may result in permanent perforation or cicatricial contraction. Unfortunately, infection is common in injuries of this type, being caused by the awakening of an old suppurative process, or by misguided attempts at treatment, usually by irrigation. It is sufficient to cleanse the concha and meatus with alcohol or ether, or to plug the ear with sterile cotton and to keep the patient in a quiet place.

La F  tra<sup>99</sup> gives the pediatricist's impression of *acute middle-ear infection*

<sup>97</sup> Journal of Laryngology, Rhinology and Otology, September, 1920.

<sup>98</sup> Rev. d. Laryngologie, de rhinol. et d'otol., 1918, xxxviii, 433.

<sup>99</sup> Journal of the American Medical Association, May 1, 1920.



in children, and it is of value to the otologist to see how these conditions are viewed by a competent observer in another speciality. The author states that among infants and young children, acute ear infections rank in number and importance only second to respiratory and gastrointestinal disturbances, but that mastoiditis is a comparatively rare complication, when proper treatment has been instituted. It is the pediatrician who most frequently sees the case first, and who must make at least a tentative diagnosis. He should be on the lookout for ear inflammations and routine examinations will frequently reveal their presence before any manifestations referable to the ear have been noticed by mother or nurse. Pain is an important symptom, but is not well localized by young children, being quite as often referred to the abdomen as to the ear. Rolling the head and putting the hand to the ear are suggestive, but often have no significance. Absence of any complaint is no proof that the ear is not involved, and fever may be present or absent without helping the diagnosis. Tenderness in front of the tragus is considered quite reliable, but, after all, a drum seen on inspection to be bulging, is the only real diagnostic sign. Retraction of the drum suggests an acute rhinitis as a cause of pain, even before the nose runs or becomes stuffy. In this class of cases there is often some redness along the malleus handle and of Shrapnell's membrane.

When the drum shows bulging and retraction in different portions, at the same time with a grayness of the membrane giving it a doughnut appearance, otologists usually incise, but La F  tra thinks that such cases subside satisfactorily without myringotomy. He deems it wise to open the middle ear only when the fever is high, the pain acute and the drum markedly bulging, if these symptoms persist without any tendency to decrease.

The incision should be ample and J- or U-shaped; the ear should be immediately irrigated and some of the solution should find its way down the Eustachian tube to the throat, showing a free passage for drainage.

In bronchitis or bronchopneum  nia, the complicating otitis usually occurs from four to seven days after the onset of the primary disease and is probably due to the prolonged coughing forcing infection up the Eustachian tube. The pediatrician should be able to use the otoscope as well as the stethoscope, as the two instruments are of equal importance.

The *otitic complications of influenza* were more thoroughly studied in the Army during the great epidemic of 1918 than ever before, and many reports have appeared in the literature, the findings being uniform in most respects. Keeler,<sup>100</sup> who was at Camp McClellan and closely observed the situation there, says that these ear infections presented several typical characteristics, there being hemorrhagic blebbing of the dermal layer of the osseous external canal and a similar condition of the drum membrane. This condition was usually a signal of severe infection. Keeler also believes in warm irrigation following myringotomy, and attributes the freedom from succeeding mastoiditis to the fact that

<sup>100</sup> Pennsylvania Medical Journal, March, 1920.

myringotomy was done at an early stage. In a plea for this well-recognized procedure, he says that delay sometimes leads to spontaneous rupture, but usually not until the mastoid or meninges have become involved. In this, he is in direct variance with La Féra and I think this statement can scarcely be concurred in by most of us. He says, as proof of the efficacy of myringotomies, that in the 120 cases at Camp McClellan, none eventually needed a mastoid operation. This seems like a very small number, De Muth,<sup>101</sup> reporting over a thousand during the same period, and Ridpath<sup>102</sup> stating that, at his Camp, they were innumerable. Coates,<sup>103</sup> comparing this epidemic with the epidemic of measles among troops in 1917, says that at that time and for a long period often twenty-five or thirty myringotomies were done daily and thinks that conditions vary greatly in different places, with strains of organisms of different virulence. In these measles cases, there were 70 mastoid operations in spite of free incision, while in a nearby camp with a different class of men under better conditions, there was only one mastoid operation during the same period. While no one would think of condemning myringotomy for that reason, it is evident that, under certain conditions, even a perfectly performed operation will not always prevent the development of mastoiditis. De Muth indeed reported a large number of mastoid operations in patients whose drums had been freely incised and said that the virulence of the infection, as seen by him, was so great that in many cases the otitis and the mastoiditis apparently developed simultaneously.

Bárány<sup>104</sup> rather agrees with La Féra in that the symptoms that demand the mastoid operation during the third week of the disease do not have the same significance during the first week. It is only when they persist after myringotomy that operation is decided upon. If the operation is performed too early when the bone is hard and uninvolved, the infection is more readily spread. He waits until the third or even fourth week unless serious symptoms, such as chills, intervene. Bárány also calls attention to the fact that mastoiditis may develop long after the middle-ear lesion has healed and been forgotten, or when it may have been too trivial to attract attention. There are the so-called cases of "primary mastoiditis," of which I saw an unusual number last winter.

High fever alone does not call for operation other than myringotomy, unless it persists for some time, and even a mastoid abscess may drain and heal spontaneously, but operation should never be delayed while waiting for this result.

**The Mastoid.** One of the lessons learned in the war was the marked difference in the practice of medicine in military as compared with civil life, particularly in regard to acute infections of the middle ear.

Harris<sup>105</sup> says that the supreme or controlling factor in military practice, so far as the upper respiratory tract is concerned, is infection. Infection is ever present, always to be dreaded, constantly to be guarded

<sup>101</sup> Pennsylvania Medical Journal, March, 1920.

<sup>102</sup> Ibid.

<sup>104</sup> Hygiea, Stockholm, February 16, 1920.

<sup>105</sup> Annals of Otology, Rhinology and Laryngology, March, 1919.

<sup>103</sup> Ibid.

against. Splendid work was done in the various cantonments in regard to the measures instituted to prevent the spread of infection. Great numbers of cases of measles developed in the Army, and, of these, the number was large who, in the course of the disease, developed acute infections of the middle ear. Many of these, in spite of the most prompt and energetic treatment, went on to acute mastoiditis, requiring operation. He found that otitis media appearing in a case of measles was, as a rule, free from pain, and that the subsequent mastoiditis pursued a quite similar course. The only sign that could be depended upon with certainty in these cases where there was no pain, tenderness or edema, was change in the upper posterior wall of the external auditory canal. That this sign was the most constant one observed is testified to by many army otologists. Harris, in operating upon these very sick patients, declined to use either ether or chloroform for anesthesia, believing that they would have served as the deciding factor against the patient's recovery. He preferred the use of nitrous oxide gas, and states that the immediate and later results have been truly remarkable. Many of these patients had bronchopneumonia at the time of operation, and some of them were under the anesthetic for two or three hours. Harris finds that the otological complications of measles in these adults are so unusual in their symptomology that their only certain means of recognition is the examination of the ear itself, and that in army life, when dealing with large bodies of men, is difficult owing to the limited number of specialists. Prophylaxis is of the utmost important to prevent such infections from developing, and he believes that warm saline gargles or 2 per cent. solutions of dichloramin-T are the best means available at present.

Coates,<sup>106</sup> commenting on the epidemic of measles in the Army and its mastoid complications, notes that, with certain bodies of troops, the existence of mastoiditis was much more marked than at other cantonments. He agrees with Harris that the findings in these cases are distinctly atypical as compared with those in civil practice, and comments upon the reasons why there should be many mastoid operations in one camp and a few in another one. His experience lay in two camps during the winter of 1917 and 1918. In the first one, where infectious diseases were very prevalent and the prevailing organism was the pneumococcus, many cases of mastoiditis developed and were operated upon. During a similar period at a nearby camp, with troops of different character, but one mastoid operation was done. In the first instance, the men were of particularly poor physique and had had none of the usual infectious diseases in childhood, having been recruited from the southern mountains, and they were peculiarly susceptible to all infections and were, in addition, largely affected with uncinariasis. This latter condition has been thought by other observers to render the subject a bad risk for operations of any character. The mastoids were, for the most part, badly infected, coming to operation rather late in the disease on account of the overcrowding in the hospital and the prevalence of bronchitis and pneumonia. No difficulties were experienced,

<sup>106</sup> Transactions of the American Laryngological Association, 1919.



however, with ether anesthesia, but there was, as a rule, greatly delayed time in healing, and poor cosmetic results were at times obtained. (Holmes, quoted below, also noted this result.) In the camp observed later, where troops in splendid physical condition were stationed, very few mastoids developed until new drafts were brought in, and then only a few. In this camp there was absence of acute infections, although the prevailing organism was the *Streptococcus hemolyticus*.

The subsequent treatment of a mastoid wound has given rise to considerable discussion. Kerrison,<sup>107</sup> stimulated by favorable reports in other lines of war surgery, has used the Carrel-Dakin method in a case of a radical mastoid. He flushed the wound on the table with the Dakin solution and placed a short gauze wick soaked with the same fluid in the cavity. The after-treatment was simple, the patient lying on one side and having the wound cavity filled with the solution every hour during the day. At night, the cavity was filled with chlorazone paste. He states that this treatment did not lessen the time of cure, but that the bony cavity seemed surgically clean from the start.

Fotts<sup>108</sup> used this method in over 60 cases of simple mastoidectomy in the hospital center at Allerey, France, with excellent results. His method was to place two rubber tubes in the mastoid wound, one emerging from each angle of the incision, which was then tightly closed in between. Irrigation with Dakin solution was conducted at two-hour intervals through these tubes, which were removed in four or five days, depending on the progress of the case and how soon smears became negative. Many of these cases were healed in from ten days to two weeks' time, although in a few the middle ears, owing to complications, were not dry for a much longer period. Potts believes, however, that this treatment will materially shorten the duration of aural discharge in most cases. That the cosmetic result is excellent, I can testify, for I saw most of his cases.

Last year in *PROGRESSIVE MEDICINE*, Davis' modified blood clot dressing was commented upon, and this year renewed interest has been given to the question of the utility of coagulated blood as a mastoid dressing by the report of Reik,<sup>109</sup> who simply reaffirms his statements, made at various times during the last twenty years, that this procedure constitutes the *ideal method* of closing the mastoid wound, that he has nothing to retract from his previously expressed opinions regarding its merits, and nothing to add to the regulations governing its performance. He believes that more men are constantly using this method. Poor results by this method are due to failure to maintain a *strict asepsis* or to perform a thorough operation. Reik condemns any modification of the original blood-clot method where primary closure is done. The use of secondary blood clot or of the use of the blood clot combined with drainage, he condemns as being unnecessary and often more of a hindrance than a help to healing. Since Reik has been the most consistent advo-

<sup>107</sup> *Annals of Otolaryngology and Rhinology*, March, 1919.

<sup>108</sup> *Transactions of Section of Otolaryngology, American Medical Association*, 1919.

<sup>109</sup> *Transactions of the American Otological Society*, 1920.

cate of this method for many years, his opinions are entitled to profound respect.

Kerrison<sup>110</sup> says that it is a generally accepted fact that the blood-clot operation on the mastoid has fallen into disrepute due chiefly to the fact that however thoroughly the diseased tissue is eradicated, the tympanum remains as an infected cavity. It results in a large percentage of failures due to reinfection from the infected tympanum or from the mastoid cavity itself. Many others who have tried the blood-clot dressing with but mediocre success will agree with Kerrison, but they all, and I think Reik himself, fail to take into account the very considerable bactericidal qualities of *drawn blood*. Recent experiments, not now available for reference, have proved that extravascular blood possesses these qualities to probably a greater degree than that contained in the vessels. I know it to be a fact that infection may remain in the mastoid or in the middle ear and yet the blood-clot dressing may be unqualifiedly successful. I have often seen it attempted in imperfectly exenterated mastoids with a large proportion of success. Reik's contention that strict asepsis is necessary is perfectly sound. This method was a failure in my hands at the base hospital mentioned above where infection was prevalent and opportunities for asepsis poor at the beginning of the service, but was most successful in the second hospital where conditions were reversed.

Holmes<sup>111</sup> expressed the same view. In the beginning of his service in a newly organized hospital where the surgical technic was not good, he found his blood-clot dressings, which had been very successful in civil practice, were breaking down with great frequency. His experience in civil practice was that the blood clot was perfect in 85 per cent. of radical operations and in 50 per cent. of the acute cases. While in the Army, with the exception of the very first cases where the wards were not crowded, they practically all broke down, even when the secretion from the middle ear had entirely ceased. This result he believes to be partially due to the undoubted overcrowding of the wards, where infection is carried from patient to patient by contact of doctors, nurses and orderlies. Exposure, owing to improper and insufficient clothing during inclement weather, particularly in going to and from the mess hall when convalescing, was the reason for many relapses in these cases, some of which were disastrous. I myself have advocated for years a modification of the blood-clot dressing consisting of a small cigarette drain being placed *into* the antrum for the first few days. With this method I have had considerably greater success in acute cases than the 50 per cent. claimed by Holmes.

Bárány<sup>112</sup> uses a similar method, although he does not call it the blood-clot dressing. The wound is sutured except for one small opening which is drained with a cigarette tampon. This drain is only left in for the first twenty-four hours and is then replaced by a piece of rubber

<sup>110</sup> Transactions of New York Academy of Medicine, Section of Otology, Annals of Otology, Rhinology and Laryngology, March, 1919.

<sup>111</sup> Annals of Otology, Rhinology and Laryngology, March, 1919.

<sup>112</sup> Hygiea, Stockholm, February 16, 1920.

tissue folded three or four times and rolled into a drain two or three millimeters thick. It is my belief that most operators of today practice the blood-clot dressing without admitting it, since they suture the wound in its entirety except for a small opening in the inferior angle, and, instead of packing the entire cavity, simply drain with a wick of gauze. In these cases it seems that the dead bone space is filled with blood-clot and that thus quick healing is secured and a good cosmetic result obtained.

In an effort to obtain quick healing and avoid deformity, Eagleton<sup>113</sup> proposes filling the mastoid cavity after operation with bone chips which should be removed from the tibia. Several pieces are placed in the wound which is then sewed up tight (another evidence of the blood-clot method being used). He states that the next day his first patient had a pain in his leg but no pain in his head. Infection took place in the wound but was successfully combated and eventually at the end of the sixth week he had an absolutely normal-looking mastoid and normal hearing. He believes this method to be of value because the cosmetic appearance of the mastoid is preserved and there are no after-dressings, but both of these results are obtained by the more simple and more easily obtained blood-clot dressing. This case is of interest, however, because it shows that a bone graft under these conditions will live even if there is some infection. The end-result he believes to be regeneration of the bone from the periosteum of the mastoid and from the bone chips placed in the cavity.

Dench<sup>114</sup> believes mastoid cases recover much more quickly when the periosteum is sutured to below the level of the antrum. He thinks this should be done particularly when the blood-clot method is used, and that there is regeneration of bone from the periosteum in these cases. In reoperating on a certain number of mastoids anywhere from one to five years after the primary operation, very large regeneration of bone was found in many. The cavity in the bone was not always entirely filled but he found a superficial layer of bone forming an outer table that closely simulated normal. Beneath this, in several instances, were infected cavities. I have seen the same condition in reoperating upon 2 cases where the blood-clot method had been used at the primary operation two or three years previously.

Certain reasons for *delayed healing of mastoid wounds* were given above. Hill<sup>115</sup> has analyzed a large number of these cases in the Army, and reached the following conclusions: The period of convalescence is mainly dependent upon the character of the operation, early healing and uneventful convalescence depending upon thorough exenteration. Cases of delayed healing and those requiring secondary operation, which were met more frequently in the diploetic and diplopneumatic types of mastoid, were caused by neglect on the part of the operator, the oversight being less likely to occur in the cellular mastoid. The points usually overlooked are the angle between the sinus and the floor of

<sup>113</sup> Annals of Otology, Rhinology and Laryngology, March, 1919.

<sup>114</sup> Ibid., Annals, March, 1919.

<sup>115</sup> Laryngoscope, March, 1920.



the middle fossa, the space between the sinus and the prominence of the digastric groove and, less frequently, the zygoma, posterior meatus wall or the tip. Operation should not be deemed complete until the solid inner plate, or, if absent, its underlying substance, is reached and the boundaries outlined, especially in the regions just mentioned. By far the best results are obtained in cases where thorough exenteration is done regardless of type, and in which the after-treatment largely consists of "scientific neglect." His treatment is light packing with plain iodoform gauze for about five days, after which only a small wick in the antrum for a few days more is allowed. The quickest healing is usually obtained in the pneumatic type of mastoid, and secondary operation is much less frequently required. Other factors in delayed healing are the resistance of the individual, and particularly the presence of general systemic diseases. Debility from long-continued sickness often plays a most important part in convalescence. The condition of the nasopharynx, presence of adenoids and diseased tonsils, etc., must be considered. The virulence and type of the infection plays a larger role. This I believe was partly responsible for the discrepancy in the number of mastoid operations in camps in different parts of the country.

Hammond,<sup>116</sup> in observing the healing process after mastoid operation, believes that a gauze wick in the mastoid should be used for facilitating the escape of such fluid as otherwise would have to drain through the auditory canal, thus prolonging the drainage. A wick should also be used in the canal itself. This wick should be changed daily until the discharge ceases. To obtain quick healing, the packing is allowed to remain for five or six days if it appears dry. If moist, it should be removed and fresh packing inserted. In disagreement with most operators nowadays, Hammond believes that the packing should completely fill the mastoid space. At the end of the first week, fine granulations begin to appear in the wound. About the tenth day, when the packing is quite dry, the mastoid wound is completely filled with boric acid, a pad of gauze laid over the wound and the auricle gently, but firmly, held back against this pad with a gauze bandage. The following day the edges of the incision have approximated and the skin wound has healed, so that in five days or a week there will be but a linear scar. Of course, the boric acid remains in the wound and, as Hammond says, it may be many months after the patient is discharged as cured before the mastoid itself has really healed. He believes the cavities packed in the old way do not necessarily "heal from the bottom" for in reoperating on cases, he finds, as does Dench, often a thick cortex with necrotic underlying cells. He does not think it necessary to pay particular attention to suturing the periosteum, which comes together sufficiently well with the ordinary suturing of soft tissues.

For many years it has been taught that in doing the *radical mastoid operation* for cholesteoma every bit of the matrix must be removed if cure is to be expected. Dundas Grant<sup>117</sup> teaches otherwise, for in those cases where the cavity is dry and the matrix pearly gray and glistening,

<sup>116</sup> Laryngoscope, October, 1920.

<sup>117</sup> Journal of Laryngology, Rhinology and Otology, May, 1920.

he leaves it intact. He states that it has a singular resemblance in these cases to an unusually delicate skin-graft, with which many of us will agree. When this procedure is carried out, healing of the case is very rapid and indeed the cavity is left smoother, dryer and whiter than usually occurs. A number of eminent Fellows of the Royal Society of Medicine have used this procedure during the last fifteen years with good results. Leaving the matrix turns out excellently because the cavity is already epithelialized and one escapes the vicissitudes which accompany trying to line it with grafts. Grant says that much depends on the appropriateness of the case. This formation is not present except in cases of long-standing which are not seen as frequently now as formerly. He does not believe that there is any disease below the matrix, the observation of Kirchner to the contrary notwithstanding. If this were so, the formation of the matrix, which is a homogeneous membrane, would be interfered with: if it is white and adherent, one can be pretty sure that there is no active disease underlying. Grant believes that the cholesteomatous membrane is nature's attempt at a dermatization of the cavity and that it, as a rule, is a very successful attempt. When it is complete, it should be retained. When small granulation tissue masses occur in these cases, they can be best dealt with by puncture with a fine galvanocautery, which causes a limited area of sclerosis in the inflammatory tissue.

Fraser and Garretson<sup>118</sup> have given the results of the *radical mastoid operation* in 248 cases. In the non-skin-grafted cases, 107 out of 172 patients presented themselves for inspection within five years after operation. Three of these were double mastoids. Of these, 37 appeared cured, while 10 others were satisfactory except that they presented evidences of want of care (accumulated wax and desquamated epithelium). This makes 43 per cent. cures. In 24 cases the inner wall was moist, but there was no pus. There was some purulent discharge in 27 cases; in 1, the cavity was filled with cholesteatoma; in 3, a false membrane had formed and in 3 there was a permanent post-auricular opening.

Hearing in 93 cases tested was improved in 38 per cent., unchanged in 39 per cent. and worse in 23 per cent.

In cases where a skin-graft was used, in 46 ears inspected, 20 appeared cured and 12 others were satisfactory—70 per cent. In 7 cases the inner wall was moist, in 4 there was slight purulent discharge, and in 1 profuse discharge. Two cases showed membrane formation.

Hearing, in the ears tested, was improved in 12, unchanged in 16, and worse in 6.

The total percentage of "cured" was 50, but it will be seen that the skin-grafted cases gave much better results than the non-grafted ones. This result is not so good as those reported by American operators and quoted by the authors. Bowers claims 75 per cent. of cures, Stucky 89 per cent., Morissette Smith 100 per cent. in 10 consecutive cases, Dench and Richards from 70 to 85 per cent. each, but, on the other hand, Harris believes these statistics misleading as in a series of cases

<sup>118</sup> Annals of Otolaryngology, Rhinology and Laryngology, December, 1919.

operated upon by other otologists and later examined by him he found but 48 per cent. dry, with improved hearing in but 8 per cent. of the dry cases. Stucky claims 19 per cent. improvement and Bowers 60 per cent. Fraser and Garretson think that Harris's figures more nearly represent the results obtained by the majority of operators, at least before the days of immediate skin grafting.

**Sinus Thrombosis.** In reporting 5 cases of lateral sinus thrombosis from their service at Camp Sheridan, Holmes and Goodyear<sup>119</sup> bring out some interesting points and make observations of value. In one fatal case, for a long time the principal complaint was abdominal pain in the presence of symptoms of sepsis and a chronic discharging ear. A radical mastoid disclosed cholesteatoma and exposed the dura but failed to give relief. Subsequently a large extradural and intradural abscess was discovered and drained. The abdominal pain increased, and at autopsy, an ulcer was found on the costal diaphragmatic edge of the spleen, and in addition, a thrombosis of the lateral sinus which had apparently extended through the veins from the side first involved without thrombosis of the longitudinal sinus. Blood culture had been negative.

The second patient showed chilly sensations and a septic temperature until after operation, with hemolytic streptococci in the aural discharge, which was evidently a virulent strain, as he succumbed in seven days. The sinus, when exposed at operation, was covered with pus, but showed no granulations, a condition the author says much more to be feared than when Nature has provided them as a barrier to infection. The oscillatory character of the temperature curve was lost following operation and the fever increased steadily to 104.2° at death.

The third patient began with bronchopneumonia, and later also developed severe abdominal pain, with a jump of the temperature to 104° without chill, following a simple mastoid operation. The fever became septic in type with epigastric pain. Blood cultures were sterile until just before operation, when the *Streptococcus hemolyticus* appeared. Following operation on the sinus, the temperature became normal, but both optic discs showed swelling of five diopters and sight was badly blurred.

The question is raised whether the choked disc is really due to obstruction of the vessels or to the large amount of packing used to compress the sinus.

The fourth case also showed the same organism in the blood-stream but there were no eye changes following operation nor were they present in the last case. This one had an exceedingly low white cell count (8000), was complicated by bronchopneumonia and had a very uneven temperature, with an occasional chill, but without definite rises and drops. The last 3 cases recovered.

Hill<sup>120</sup> reports spontaneous hemorrhage from the lateral sinus six days after a simple mastoid operation. In many respects this case is strikingly similar to one I<sup>121</sup> reported. Both cases began with a "cold," headache

<sup>119</sup> Laryngoscope, January, 1920.

<sup>120</sup> Annals of Otolaryngology and Rhinology, March, 1919.

<sup>121</sup> Ibid., December, 1918.



and malaise, each was twenty-one years of age, one a man and the other a woman. Free incision of the membrana tympani released sero-sanguineous fluid. Temperature about  $100^{\circ}$  with slight mastoid tenderness which subsided only to reappear later. The middle-ear process subsided in each case, but after two weeks there was an exacerbation. A simple mastoid under ether was performed in each case about the twenty-first day, but neither case did quite well though the local condition of the wound was perfect. Fever and chilly sensations were present, running to  $104^{\circ}$  in Hill's case and  $106^{\circ}$  in my own. In the latter, there was a severe spontaneous hemorrhage while dressings were being changed on the fifth day, which was quickly controlled by packing and the jugular ligated shortly afterward. Recovery was uneventful except one metastatic abscess in the buttock. In Hill's case, septic symptoms developed two days after the hemorrhage and jugular ligation was done on the third day after. Two other hemorrhages followed in a few days, and metastasis to the shoulder-joint took place, but eventually this patient also recovered. Blood cultures were positive for hemolytic streptococci in both cases.

Toby<sup>122</sup> says that the surgeon should aim to make his diagnosis and to operate during the stage of phlebitis before advanced thrombosis has taken place. To be able to do this requires very careful clinical and laboratory observations. No symptoms are constant and the so-called "typical case" of the text-books is rare. Each case is a problem in itself and many deaths have occurred because the observer waited until too late for classical symptoms, thereby missing the chance for an early and hopeful operation.

Four types of temperature charts are recognized in lateral sinus infection:

Type A, shows the accepted picture of acute sepsis with sudden elevations and equally sudden remissions to normal or subnormal. These may occur every few hours, but once a day, or at intervals of thirty-six or forty-eight hours, resembling a malaria chart.

Type B. There is no elevation of temperature of more than one or two degrees but there is a persistent irregularity with an evening rise.

Type C. Temperature elevation of two or three degrees without return below  $100^{\circ}$ . Frequently this persists for several days and then returns to normal, but nearly always recurs in a few days more.

Type D. No fever at all, although at the mastoid operation a broken down sinus wall with definite thrombosis is found. This occurred 11 times in 73 cases.

It is evident from this that the temperature cannot be considered of definite diagnostic value. Its presence indicates infection but its absence or the absence of typical characteristics do not exclude sinus thrombosis.

True chills occur in less than 50 per cent. of all cases, but a large majority experience chilly sensations, with sweating. Dull headache or a sensation of pressure is often present accompanied by drowsiness.

Choked disc may be present in about 10 per cent. of cases and more commonly paresis of the sixth nerve. The average leukocytosis is 15,000 with a polymorphonuclear percentage of 78.

Too much emphasis has been placed on the value of the blood culture as a diagnostic sign. When present, it is an indication of infection, but it may be due to such other causes as pneumonia, tonsillitis, endocarditis, erysipelas, etc., nor does a negative culture preclude the presence of sinus infection especially in the early stages.

Edema or infiltration with tenderness on deep pressure over the mastoid emissary vein is the most constant objective symptom. It is practically always present and can be readily differentiated from mastoid edema and tenderness. Tenderness or tumefaction along the course of the jugular is regarded as being largely mythical.

An extradural or perisinus abscess will often simulate symptomatically a thrombophlebitis, and the mastoid operation should always be performed and the sinus inspected (in other words the diagnosis should be made) before the jugular is tied.

The prognosis, as influenced by ligation or resection of the jugular, is hard to determine. Ninety per cent. of cases with simple ligation recover but it is well known that a large number of unoperated or unrecognized cases also recover after a longer or shorter course, with or without pyemia. Toby believes he is supported by statistics in saying that simple ligation is the logical operation, though in a small percentage of cases, where the vein is thrombosed, excision is necessary. Simple ligation requires a very short time for its performance, there is consequently little shock, the tissues of the neck are not freely exposed to infection and the ultimate scar is negligible. Resection requires a long time and there is the added shock to an already sick patient, a tremendous area of neck is opened to infection, the resulting scar is unsightly and, above all, it is rarely necessary for the cure of the condition.

The jugular should be exposed through a small, transverse incision and tied above the facial branch with a double ligature. Nothing is gained by cutting the vessel. After tying, the vein is dropped back into its bed, buried sutures approximate the soft parts, the skin incision is closed with a few horse-hair sutures and a collodion dressing is applied without drainage. After this, the sinus operation may be proceeded with in the usual manner.

Toby states that fortunately the anatomical structure of the torcular precludes the probability of direct extension of the thrombosis into the opposite sinus, a statement at variance with the opinion of Holmes, given above.

It must be borne in mind that a localized central pneumouia may closely simulate a lateral sinus thrombosis in its symptomatology. Erysipelas must also be taken into consideration, especially the type which gives evidence of sepsis for several days before local objective signs occur. Malaria, tonsillitis, arthritis and other local infections often give rise to perplexing symptoms when associated with acute middle ear or mastoid infections. And, finally, the opposite sinus may

be infected also, although this occurrence is extremely rare, only one authentic case having come within the observation of the author.

Jones<sup>123</sup> is in accord with Toby in most respects and believes in conservative surgery. He thinks that this condition is a much more frequent complication of otitis media than is generally supposed. In the study of 50 cases gathered from recent literature, he finds that 43 recovered and 7 died.

(a) In the 35 cases where the jugular vein was either ligated or resected, 5 died,  $14\frac{2}{7}$  per cent.

(b) In 21 cases, the sinus was opened, the jugular ligated or resected afterward, 2 died,  $14\frac{2}{7}$  per cent.

(c) In 15 cases, where the vein was not treated surgically, 2 died,  $13\frac{1}{3}$  per cent.

(d) In the 35 cases where the vein was exposed for surgical treatment, it was found collapsed in 8 cases. He quotes from Körner's statistics showing that 58.3 per cent. recovered where the sinus alone was treated, while in those cases where the jugular was ligated just before or after the sinus operation, the percentage of recoveries was 58.6.

Jones believes that thrombosis of a bloodvessel is an attempt on the part of nature to prevent infection from entering the blood-stream. The virulence of the infective agent and the resistance of the patient will determine success or failure. When the infection is not arrested by the thrombosis, general septicemia with local pyemic manifestations results. At all events, the infection is at least temporarily arrested by the thrombus and the only surgical need is to incise the sinus wall to permit the escape of the thrombus when it begins to disintegrate. As there seems to be as much danger of systemic infection from the torcular end, ligation of the jugular would not seem to answer the requirements. Statistics indicate that the mortality is as great where routine ligation of the jugular is performed as it is where ligation is reserved for special cases. In any case, the sinus should be exposed before the vein is ligated.

Ligation and resection are valuable procedures, but should only be used in the actual presence of septicemia or thrombosis of the vein itself. In the absence of positive signs of these two conditions, Jones advocates simply removing the thrombus from the lateral sinus and awaiting developments. Although ligation is practised by almost all otologists, the opinion is expressed that it is radical and unnecessary except in selected cases.

That thrombosis of the internal jugular vein may occur as a so-called primary condition and is not always secondary to thrombosis of the lateral sinus is deduced by Mosher<sup>124</sup> from a case of his own where it followed a retropharyngeal abscess with pus beneath the deep cervical fascia, and one cited by Goldman in which an acute tonsillitis was the cause. Similar cases are probably more common than generally supposed but are seldom recognized. When there has been a previous throat infection which has cleared up and the patient develops a swelling of the side of the neck, with a septic temperature and chills, the internal jugular

<sup>123</sup> *Annals of Otolaryngology, Rhinology and Laryngology*, December, 1919.

<sup>124</sup> *Laryngoscope*, June, 1920.



should be exposed and its condition determined. Every case of peritonsillar or retropharyngeal abscess, active or quiescent, that has chills or a septic temperature, probably has thrombosis of the vein.

The vital structure in the neck, from the standpoint of infection, is the internal jugular vein. In deep cervical abscess, the vein is always exposed to the danger of infection. In such cases where there occur chills or septic temperature, there is either a phlebitis or a thrombosis of the vein. Such symptoms in a case of abscess of the neck mean that the vein should be exposed and its condition determined. If phlebitis is present, the vein should be tied; if thrombotic, it must be excised. Pus about the internal jugular vein is analogous to pus in contact with the lateral sinus except that, in the former situation, much more pus can accumulate around the vessel. A deep cervical abscess should be treated exactly as a perisinus abscess, and, as in the latter case, early drainage will probably save the vessel from infection. The vein should be tied at the first chill or other signs of infection. It seems strange that with the dramatic picture of sinus thrombosis before us for so long a time, we should have failed to recognize a similar condition in the same vein lower down, which can originate in the tonsil just as readily as in the mastoid.

**Facial Paralysis.** The *Facial Nerve*, says Dan McKenzie,<sup>125</sup> is more often paralyzed than any other motor nerve, due to the fact that it occupies a long (3 cm.) fine tunnel of bone in intimate relationship to a mucosa-lined cavity, the middle ear, which, in its turn, is frequently the seat of disease. This article on the facial nerve, extending through a number of issues of the Journal, is most exhaustive and should be read in its entirety by every otologist. In the vast majority of cases, facial paralysis must be considered as otogenic in origin and every case should be subjected to a strict otological survey. Central lesions cause a certain number, but as these are frequently accompanied by eighth nerve involvement and as their diagnosis is now largely made by otological or neuro-otological examination, the above mentioned dictum still applies.

In *paralysis from fracture of the bones of the skull*, the onset may be immediate or delayed. If the former, it is assumed that the nerve has been directly injured and that the paralysis is likely to be permanent. If there is delayed onset, at times even two or three weeks after injury, it is assumed to be caused by callus pressure and the prognosis is distinctly better.

Operative trauma of the seventh nerve may follow the skin incision for the mastoid operation in children below the age of two years if the initial cut is made too far forward. Up to this age, the exit of the nerve from the stylomastoid foramen is not yet guarded by the growth of the mastoid process. In adults this never happens. In the simple mastoid operation the nerve should not be injured, but care should be exercised in curetting forward toward the position of the Fallopian canal in a diseased cellular type mastoid as the cells occasionally reach the vertical

<sup>125</sup> Journal of Laryngology, Rhinology and Otology, May, 1920.

segment of the canal. If the paralysis is already present, additional care should be exercised in order not to further injure the nerve which may be presumed to be exposed. In the performance of the radical mastoid operation the points where the nerve is most subject to injury are in its vertical segment when an improper attempt to reach the antrum is made, in breaking down the "bridge" over the aditus, more commonly in curetting granulations in and around the sinus tympanicus, and lastly in shaving down the posterior bony canal wall. In this last procedure, the level of the floor of the aditus is taken as the limit of safety and Dundas Grant advises using the chisel reversed so that the bevel tends to plane out of, instead of into, the bone.

The prognosis of traumatic paralysis, in whatever way produced, is not good unless it is possible by immediate operation to remove the cause or to bring the severed ends of the nerve into permanent contact. It is not altogether hopeless in any case, and a certain amount of recovery is usual. If the paralysis is definitely absent after the trauma and only develops in from two to eight hours after the accident, and if it shows a progress which is gradual, it has probably been caused by contusion and hematoma. It may, however, develop rapidly from the same cause, since the nerve, which fills the canal very fully, is easily compressible. If of still later origin, a diagnosis of neuritis may be made, and recovery anticipated in from three to six weeks.

McKenzie<sup>126</sup> says there is frequently a dehiscence in the bony covering of the canal and that therefore the nerve is exposed to the action of bacterial toxins in middle ear and mastoid suppuration, even before necrosis takes place. Inflammation of the middle ear of all grades of severity, even mild evanescent catarrh, may produce facial paralysis. At times the inflammation that produces the paralysis is so mild as to entirely escape the patient's notice. It is due either to pressure or to a neuritis; by direct pressure of the swollen mucosa or tympanic exudate upon the nerve through a dehiscence in the tympanic wall of the canal, or it may be induced by an extension of the inflammation to the neurilemma by way of the bloodvessels, or by a congestion of the bloodvessels compressing the nerve in its rigid canal.

The author feels that many of the so-called "rheumatic" cases are really due to undiagnosed catarrh of the middle ear; but it is always produced by an acute or subacute lesion and never by an old chronic adhesive process. The treatment is, obviously, immediate incision of the membrana tympani, and amelioration of the symptoms may be expected to follow at a greater or less interval of time. The same treatment applies to those cases in which acute suppuration is the exciting cause, but it is imperative to do a mastoid operation even in the absence of mastoid symptoms as soon as the paralysis manifests itself. In those cases in which the cells are the chief seat of suppuration and in which operation shows the lesion of the nerve to be in the vertical segment, a simple mastoid operation will probably be all that is required to cure both the middle-ear infection and the paralysis, but where the

<sup>126</sup> Journal of Laryngology, Rhinology and Otology, July and August, 1920.

site of the nerve lesion cannot be determined, a radical operation must be performed and the tympanic cavity cleaned of its contents, care being exercised not to subject an exposed nerve to further injury. The usual exposure is in the postero-external wall of the tympanum, and curetting in this region must be very gentle, as the last remaining fibrils of the nerve may be easily severed. If the nerve can be identified, and if it has been severed by disease or accident, the ends, if possible, should be brought together and laid in contact, without any gauze packing being inserted. In most cases, however, it is not possible to discover the site of the nerve lesion. Search should be made with a probe and the face watched for twitches.

After operation, if paresis only is present, improvement may be expected in as short a time as two weeks; but, if complete paralysis exists, an interval of from six months to a year is not unusual before the first sign of returning power in the facial muscles is observed.

*Facial Paralysis in Tuberculosis of the Ear* is a common and early sign, being present in about 45 per cent. of cases. Chronic painless suppuration of the ear in childhood, with paralysis present, is almost certainly due to tuberculosis. The prognosis is unfavorable but the radical operation should be performed as soon as the diagnosis is made, as early cases may be rescued by timely interference.

*Facial Paralysis from Epidemic Meningitis* is not uncommon and is frequently accompanied by a labyrinthitis ending in absolute deafness. It is common experience that, while the destruction of function of the eighth nerve is permanent, recovery is usually complete from involvement of the seventh. The difference in their ultimate fate is due to the wide divergence in vulnerability between the highly specialized and delicate structures in the labyrinth and the portio dura with its motor axones.

McKenzie<sup>127</sup> thinks that *Facial Paralysis Due to Herpes Zoster* is not generally recognized, since it is not a common condition. Herpes of the cranial nerves is supposed to be due to inflammation of the ganglion, such as the Gasserian of the trigeminal or the geniculate of the facial. It may attack the cochlear ganglion and thus be responsible for some inexplicable cases of sudden nerve deafness.

When more than one nerve is attacked, the onset is not simultaneous, but is almost always limited to one side of the body. Severe pain is an early symptom, being felt deep within the ear. The herpetic eruption usually comes next, and may be so inconspicuous as to escape notice. It varies from a few spots on the auricle, cheek or side of the tongue to a series of angry clusters producing much pain and discomfort. The skin eruption usually disappears quietly, but the spots on the tongue and tonsil rupture and leave shallow ulcers. Paralysis sets in shortly after the herpetic display and is gradual in onset, but becomes complete in a few days. The patient looks and feels ill. The resulting paralysis may last for months or may be permanent, and in any case, if complete, it remains unchanged for about six months and may require two years for complete restoration of function.



In all recent cases of facial paralysis, a search should be made for traces of herpetic spots or a history of such having been present. A supposed tonsillitis may give the clue, or ruptured herpetic vesicles in the external canal or drum head may cause the disease to be mistaken for middle-ear suppuration.

*Postoperative Facial Paralysis* that comes on in from three days to a week after operation is caused by direct infection during operation, setting up an acute neuritis of the nerve which disappears in a few days or weeks. The peripheral facial fibers show a high tendency to regenerate, and return to normal is facilitated if the middle-ear suppuration and infection of the nerve sheath is cured. Even in cases of long standing, the outlook for regeneration of the fibers is favorable if the cause is removed. The chance of recovery from facial paralysis is greater if the paralysis is incomplete, and also if it has developed slowly. Cases with retained electrical excitability often show quick and complete healing in a few weeks, and it is seldom that a facial nerve lesion remains unhealed in the presence of retained faradic excitability.

Voorhees<sup>128</sup> indicates that conservative treatment by massage and electricity should be tried for six months or a year before resort is had to surgery. This may be begun as soon as acute inflammation or infection has subsided, except in those cases due to herpes, in which, as McKenzie points out, electrical treatment should not be instituted for at least six weeks. Either the faradic or galvanic current may be used depending upon which stimulates muscular action best. It should be applied for from five to ten minutes daily, and gradually decreased as improvement becomes more manifest.

Facial anastomosis with the hypoglossal or spinal accessory nerves offers the only chance in cases of long standing, and should be resorted to in those cases showing loss of faradic excitability and decreasing galvanic excitability of the muscles. The anastomosis should be done within two years, as after that time the nerve has usually completely degenerated throughout its entire length and the annexation of a sound motor nerve is without result.

An alternative to facial anastomosis is offered by Fenwick<sup>129</sup> and consists in grafts from neighboring muscles. This is applicable in those cases where end-to-end repair of the nerve cannot be effected and in lacerated parotid wounds where the main trunk has already broken up into the parotid plexus and repair of the diverging branches does not come into the realm of practical surgery. Briefly, the technic is to expose the temporal fascia through an incision in the hair line from the zygoma to the upper limit of the temporal fossa. Two parallel incisions are then made with the same limits as above, through fascia and muscle down to the bone, in the direction of the muscle fibers and including a strip of muscle as thick as a man's thumb. This ensures preservation of the blood and nerve supply of the graft. A smaller slip anterior to this is isolated, and both are detached from the underlying bone. An incision is made under the eyelid in one of the "crows' feet," the skin

<sup>128</sup> Laryngoscope, June, 1920.

<sup>129</sup> British Medical Journal, November 29, 1919.

tunnelled and the anterior slip of muscle drawn through and sutured to the fibers of the orbicularis palpebrarum with catgut. An incision is now made in the line of the cheek furrow and the lower half of the nasolabial groove, and the skin tunnelled to make a continuous passage from the temporal wound to the corner of the mouth. The large slip of temporal muscle is drawn through this channel and sutured to the superficial fascia exposed in the cheek wound and to the orbicularis oris below and slightly mesial to the corner of the mouth. The facial incisions are closed with horse-hair, the cut edges of the temporal muscle are brought together as far as possible and the temporal skin wound closed. Faradism and massage should be employed early and the patient should daily exercise his facial expression before a glass. The

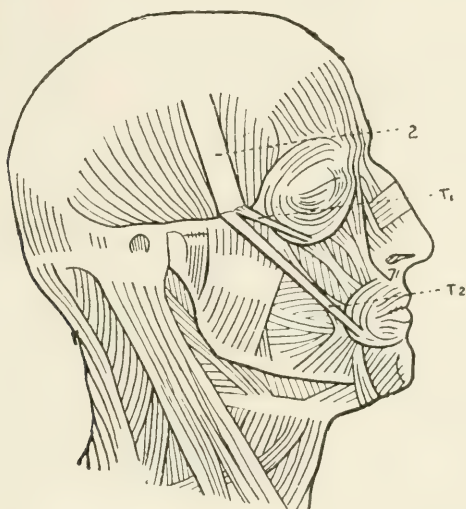


FIG. 50.—Denuded area in temporal. T<sub>1</sub>. Slip of temporal muscle inserted into orbicularis palpebrarum. T<sub>2</sub>. Slip of temporal muscle inserted into orbicularis oris. (Fenwick.)

grafted strips of muscle will continue to function. This operation is more likely to ensure permanent improvement than mere shortening of the lower lid.

**Vestibular Reactions.** Carpenter<sup>130</sup> thinks that the otologist should never be content with making a diagnosis of nerve deafness but should determine whether or not the lesion is of intracranial origin. Many cases of tumors of the auditory nerve consult the otologist long before the neurologist or the brain surgeon would be likely to see them, and the otologist should be capable of making a diagnosis in the early stage of the disease.

Heitger<sup>131</sup> considers the subject from the same angle since many of the chief complaints of the patient, such as impaired hearing, tinnitus, headache and vertigo, which lead him to consult the otologist, do not

<sup>130</sup> Transactions of Southern Medical Association, 1919.

<sup>131</sup> Journal of the American Medical Association, September 18, 1920.

always indicate primary ear lesions. These are the presenting symptoms and because of their annoying character they obscure other manifestations of existing nervous disorders. There should, of course, be coöperation between the neurologist and the otologist in studying these borderline cases. It is a fact of good augury that such a relationship between the two branches has already been established in most centers through the work of the neuro-otologist. Vertigo is essentially an ear study, and while these tests do not reveal everything connected with this symptom, they at least furnish a good working basis, thus enabling us, in the majority of cases, to make a diagnosis and institute intelligent treatment. He defines vertigo as meaning a sensation of motion which is contrary to the fact. These tests are of value to the neurologist since they offer a way of differentiating between labyrinthine and intracranial lesions, and assist in intracranial localizations for the surgeon; they will often determine whether or not a given case is operable, and, if so, where operation should be done, and no skull should be opened until the patient has had a thorough examination of his ear mechanism supplementing other known methods of diagnostic value. To the syphilologist they offer additional data for early diagnosis and to the determination of the early involvement of the central nervous system; they assist in the recognition of neural recurrence, help in checking up therapeutic activity and efficiency, and in some cases assist in determining whether or not the patient is cured, even going in selected cases beyond the blood or the spinal fluid examinations. In the study of eye palsies, they offer material assistance to the ophthalmologist and are of great value in the analysis of the cause of spontaneous nystagmus and in the determination of the degree of paresis or paralysis of the eye muscles and eye movements. The otologist employs them as a routine in his own work in determining whether he shall, or shall not, operate on the labyrinth and whether he is dealing with the labyrinth, an eighth nerve, or intracranial, lesion.

Any definite deviation from the normal response evoked by the so-called Bárány tests is usually to be considered on a pathological basis until proved otherwise, and an attempt should always be made to check the findings on a single lesion basis. Reliability and accuracy of the nystagmus as a test has been subjected to question because of the effect of repeated rotation on this reflex, some investigators claiming that there is a gradual reduction to such as to vitiate its value in practice. Heitger himself has subjected several professionals to the turning reactions, and in working on these men who have been accustomed to revolutions which are more rapid than can be produced in the turning chair he has shown that there is no reduction in the duration of normal nystagmus although a marked reduction has occurred in vertigo and its objective response, falling and past-pointing. It must always be remembered that intracranial pressure can upset any theory (such as occurs in internal hydrocephalus).

Kerrison,<sup>132</sup> from a study of a number of cases of vestibular vertigo,

<sup>132</sup> *Laryngoscope*, October, 1920.



says that we shall have a larger foundation upon which to base a prognosis if we keep in mind these facts:

1. Vestibular vertigo may be relieved by a spontaneous arrest in the progress of the primary lesion. The vestibular mechanism, though functionally impaired, becomes quiescent or stable in its impairment so that the opposite normal labyrinth and other accessory factors in equilibration (tactile, arthrodial and muscle senses, and the special sense of sight) become completely compensatory. This as a temporary condition, coincident with the intervals between recurrent attacks, is probably common enough.

2. Actual cure or permanent cessation of vestibular vertigo can be brought about in one of two ways, *i. e.*, (a) actual restoration of the vestibular nerve and end-organs to a normal condition; (b) by absolute nerve paralysis, *i. e.*, absolute loss of vestibular function. The prognosis is favorable and to be relied upon, therefore, as one can foresee one or the other of these eventualities.

The vestibular nerve is comparatively insusceptible to injuries from without, except by direct mechanical injury of the labyrinth; thus, sound concussions or the shock of loud detonations, sudden air compressions, as from explosions within a confined space which often profoundly affect the cochlea, affect the vestibular mechanism little or not at all. Not a single instance of serious injury to the static labyrinth from such causes has been reported. Chronic non-suppurative lesions of the ear involve the cochlea much more frequently than the static labyrinth. This is shown by the comparative frequency with which a cochlear defect can be demonstrated in deaf patients who have never suffered from vertigo and in whom no vestibular loss of function is present. On the other hand, experience has shown that the vestibular nerves have rather a special susceptibility to the influence of toxic agents reaching the ears by the vascular or lymphatic symptoms, *e. g.*, from the various forms of intestinal auto-intoxication, infection from diseased tonsils, dental root infections, and foci of infection in different parts of the body. Constant or semi-constant vertigo, as a result of a functionally dead labyrinth, is a clinical impossibility. Coincidence of a functionally inactive labyrinth and prolonged or persistent vertigo suggest, therefore, either that the labyrinthine lesion is potentially active and progressive, or that the vertigo is intercurrent or to be otherwise accounted for. Vertigo depending upon a vestibular nerve neuritis of recent development, the cochlear mechanism escaping injury, recovers quickly when the cause is removed. In vertigo depending upon a chronic, non-suppurative lesion involving the static and auditory mechanism alike, the prognosis is exceedingly uncertain, *i. e.*, the probability of recurrent attacks from slight causes is very considerable. Cases of vertigo beginning with a sudden onset of severe and characteristic vestibular type give, as a rule, a distinctly more favorable prognosis than do the more indefinite types of gradual development. Vertigo of non-vestibular type, even in the presence of a demonstrable vestibular lesion, constitutes—from the otological viewpoint—a very questionable basis for either a prognosis or a plan of treatment.

**Aviation.** During the War, the study of the ear as a motion-sensing organ received tremendous impetus from the fact that so many young men took up the specialty of aviation, and the Air Service Board conducted a special laboratory at Mineola, and also one in the A. E. F., to make experiments and conduct studies on the physiology of the ear with special reference to flying.

Lewis<sup>133</sup> had a large part in directing these experiments, and his conclusions are:

(a) That the normal individual, the deaf-mute whose vestibular function is unimpaired and the tabetics whose vestibular functions are unimpaired, seem to be equally sensitive to acceleration either upward or downward.

(b) That during slower motion at a sustained rate of speed upward or downward the deaf-mute whose vestibular function has been totally abrogated is totally unable to sense accurately the character of the action to which he is subjected, but he is keenly sensible of being subjected to some kind of motion; whether this is vertically upward or vertically downward seems to be pure guess-work. The other individuals tested all evidenced sensory illusion and always in the shape of a relative reversal varying in degree between a sense of partial or complete arrest of motion and inception of motion in the opposite direction. This was more marked in the tabetic.

(c) Susceptibility to illusion of motion-perceiving, naturally is directly proportionate to the keenness of the ability to make accurate qualitative perceptions; in other words, the illusions of motion in the absence of vision are largely attributable to the vestibular apparatus.

He goes on to say that the general condition of the aviators' ears, nose and throat must be good, as the ground soldier can stand still while the aviator cannot. Motion-sensing, therefore, assumes great additional importance to the aviator. Of the senses concerned in motion-sensing, the vestibular sense is the only one whose utility remains constant; hence the importance of determining the aviator's possession of requisite vestibular sense. Vestibular tests not only determine the functional condition of this portion of the internal ear, but give definite information concerning the integrity of parts of the medulla oblongata, pons, cerebrum, and particularly the cerebellum. Observations made in an extensive series of blindfolded experiments on normal persons, on persons with non-functionating vestibular apparatus, on persons lacking hearing only, and on persons with impaired deep sensibilities indicate that perception of motion in a linear direction is sensed:

(a) During acceleration, most accurately by those whose vestibular apparatus is functioning.

(b) At a sustained rate of speed accurately by each group except those lacking deep sensibility.

(c) During retardation accurately by those whose vestibular apparatus is functioning.

(d) Arrest of motion ensuing upon motion in a linear direction is

most accurately detected by the group lacking vestibular function but in possession of unimpaired deep sensibilities.

Special ability to estimate accurately the degree of falsity of oft-repeated motion-sensing illusions may be developed in normal persons. This special ability enables its possessor to maintain safe bodily relation with his environment during the existence of the motion-sensing illusions with which he has become familiar from long experience.

Fisher and Lyman<sup>134</sup> have made a special study of the ear in "Stunt" flying along the lines of the experiments noted by Lewis. So many of the accounts of crashes given by pilots who survive emphasize vertigo, that the organ responsible for dizziness when the individual is whirled around, namely, the ear, was made a subject of investigation in the Research Laboratory by the construction of a special machine in which they were able to place the aviator in all positions assumed during stunt flying and to test his reactions. In this manner, the spinning nose dive, the tight spiral, the loop and the Immelmann turn were studied extensively. They say that it is of course true that the experienced stunt flyer is not, as a rule, upset by vertigo induced by these stunts because of the many hours of practice he has had, but no matter how well trained he may be, he may occasionally find himself, especially in actual combat, doing whirling in a greater amount and at a greater rate of speed than his training has prepared him for, and an understanding of the underlying principles of the vertigo induced in these different positions might be the means of saving his life. The greatest usefulness of the knowledge that stunting is an ear problem lies in the fact that the flyer may be educated to disregard the vertigo effects of his stunts in the laboratory instead of among the clouds and by the use of this machine to acquire, without danger, a tolerance to evolutions to a degree impossible in the air. They find that the great danger is in the "coming out" of the maneuver, when the plane of vertigo is suddenly changed. This being very disturbing, the pilot is apt to lose himself and attempt to correct this illusionary movement by throwing himself in the opposite direction.

Fisher and Babcock<sup>135</sup> find the duration of after-turning nystagmus is not impaired by flying, and they think this conclusion is absolute and final on account of the very large number of aviators who have been examined. Moreover, it would seem, from the evidence at hand, that this also applies to acrobats, whirling dancers, etc. Repeated turning experiments on normal persons have occasionally produced an apparent slight shortening of nystagmus, but this they believe to be due to voluntary "gaze fixing," or to some pathological condition. They claim that the use of convex glasses prevents "gaze fixing."

These findings are confirmed by Levy<sup>136</sup> who found an average of twenty-three seconds after-turning nystagmus in accepted applicants of sixty-seven physical examining units. A later examination of flyers showed an average duration of slightly over twenty-four seconds, which is probably due to the fact that there were few flyers examined with less than twenty seconds nystagmus, while in the examining unit work there

<sup>134</sup> Journal of the American Medical Association, December 14, 1918.

<sup>135</sup> *Ibid.*, 1919, lxi, 779.

<sup>136</sup> *Ibid.*, lxx, 716.



were a great many more. It was found that nystagmus is not diminished by repeated turnings, although past-pointing and falling reactions were slightly diminished in flyers of one hundred hours or more experience, being most noticeable in flyers who have had the greatest number of hours. As past-pointing and falling are objective signs of vertigo, this diminution is due to the fact that the flyer is learning to interpret his vertigo and for the same reason more rapidly recovers his poise.

Hunter<sup>137</sup> has made a further study, limiting himself to the falling reaction in acrobats and aviators. Of the 27 men studied, 11 were instructors in acrobatics varying from thirty-five to over six hundred hours of acrobatic flying. The average degree of falling was 2.9°. The least response was shown by the man who had the second longest experience. The difference between the experts and the untrained men was very marked, and showed without doubt that men used to air work give less response to the falling test than ordinary men. Hunter finds that these acrobatic aviators have nystagmus of normal duration, confirming Fisher and Babcock and Levy. His observations on nystagmus were made on several hundred expert aviators. Examination of tight-rope walkers also gave normal nystagmus. As past-pointing is an entirely voluntary act, it appears that through training these men have learned to ignore excessive stimuli and sit up straight in spite of the fact that they feel that they are turning. He suggests that this resistance may be due to their tactile, muscular, articular, tendinous and deep sensation tracts, which have become highly trained, and that they get instant information from the seat of the chair, helping orientation. It is a common observation in examining men for their sense of motion that any auditory or visual stimuli will immediately help them to orientate themselves and correct the false impression given by extensive stimulation of the labyrinth.

The function of the *Eustachian tubes while flying* has been studied extensively by Scott.<sup>138</sup> Normal Eustachian tubes open once only during each act of swallowing, the difference in atmospheric pressure within or without the tympanic cavity being thus equalized. Even when the tubes act normally, it is necessary to swallow rapidly and frequently to keep pace with the continued and often rapid changes of pressure which take place during descents. When flying at a great height for a long time, and especially if engaged in the exertions of combat, air men are liable to breathe with the mouth open, the throat is apt to get parched and swallowing becomes nearly impossible. If this occurs, and the normal regulating mechanism for opening the Eustachian tubes proves unequal to the task, considerable discomfort, or even intense pain and distress are often experienced. These symptoms may be only momentary, or they may last for some time after. In these cases, the drums are found retracted. Scott believes that these symptoms, as the result of inefficient Eustachian tubes, are preventable. Vertigo, vomiting and forced movements which interfere with the proper control of the aëroplane are sometimes induced by the unequal pressure in the ears resulting

<sup>137</sup> Laryngoscope, May, 1920.

<sup>138</sup> Journal of Laryngology, Rhinology and Otolaryngology, August, 1920.

from unilateral Eustachian obstruction. To prevent the occurrence of such symptoms, rules were formulated for the British Aviation Service as follows:

1. That aviators should not fly with a cold in the head, sore-throat or when unable to inflate both Eustachian tubes at will. Airmen with large bilateral perforations of the tympanic membrane do not feel the ear symptoms experienced by those with normal drums and they may be permitted to continue flying duty.

2. As normal tubes can be opened at will by swallowing, aviators should use chewing gum to stimulate the flow of the saliva, especially while descending.

3. Airmen who cannot, upon swallowing, open the Eustachian tubes repeatedly and rapidly, should make it a rule to self-inflate the ears by the Valsalva method and should begin to do so at the commencement of the descent, repeating the procedure once every thousand feet.

Scott believes that pilots do not appear to have derived any assistance from the semicircular canals in estimating their position of space while flying, for many of them admit losing the sense of position in dense clouds. He also believes that the reactions to rotation may be excessive in some individuals and suppressed in others, but that in neither case do the reactions of the semicircular canals serve to indicate the airman's probable flying ability.

Violent opposition to the fact that nystagmus is not reduced by repeated turning as indicated by the work of Fisher, Babcock, Levy, Hunter and others is manifested by Griffith,<sup>139</sup> who has conducted a series of experiments on animals. He believes that otologists are in a false position because they admit that vertigo, past-pointing, falling, etc., may decrease or even disappear on practice and yet claim that after-turning nystagmus is not reduced. In order to show that the reduction of after-nystagmus, when found, is not due to gaze fixing or fatigue, Griffith used white rats for his experiments, claiming that this animal lacks distant vision as well as the organic means of fixation. He believes the explanation to an appeal to fatigue to be fanciful because even after the lapse of a day when the subject is turned, the decrease in the nystagmus is found to have remained stationary. If fatigue was the cause, one would naturally expect to find at least partial recovery in this length of time. The use of convex lenses he believes to be equally fallacious because they do not eliminate all fixation, the objects still appearing in blurred outlines. Furthermore, he believes that the use of the lens increases *per se* the time of nystagmus. The eyes must be examined, also, by the observer through the lens, thus bringing the head into tolerably clear vision of the subject and enabling him to fix his gaze. Observations made behind the lens are inaccurate. He finds that in normal individuals whose after-turning nystagmus averaged twenty-five seconds, when glasses were used the nystagmus increased to forty seconds or more. In his experiments upon rats, he believes he has shown conclusively that decrease in nystagmus is the inevitable

<sup>139</sup> Laryngoscope, January, 1920,

effect of continued rotation and that in some cases all ocular movements subsequent to the turning disappear. In ten rats tested, every one wholly lost its ocular movements after rotation of from ten to eighteen periods. The decrease was so constant as to show within any single day and the decrease of the time of nystagmus was paralleled by a decline of such other effects of rotation as nausea and movements of the head. The appearance and the disappearance of nystagmus he believes closely associated with all the other effects of rotation.

Griffith<sup>140</sup> followed this study with other experiments. He finds that whirling dancers and gymnasts can be made to lose their "after-nystagmus" by being rotated for three minutes daily for two or three weeks.

<sup>140</sup> Laryngoscope, March, 1920.



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